

**Bethel College Mennonite Church Creation Care Committee**  
**Creation Stewardship Note # 41, October 26, 2011**  
**FEEDING NINE BILLION PEOPLE: CAN THE WORLD'S FARMERS DO IT?**

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**What have the “experts” said about feeding the world?**

About 200 years ago the British pastor, Thomas Malthus, argued that human population would grow faster than food production and concluded that “premature death” would “visit the human race.” Some 45 years ago Stanford Professor Paul Ehrlich concluded that “...in the 1970s and 1980s...millions of people would starve to death.” The American baseball player/philosopher, Yogi Berra, took a more cautious position: “Prediction is very hard, especially if it’s about the future.”

**What factors will determine the amount of food required in the future?**

The major factor is population growth. Despite slowing growth rates, by 2050 the world’s human population, growing by 70 million/year, will reach about nine billion, up from seven billion at present. Most of this will occur in the developing world where some food systems are already stressed. A second important factor is the continued worldwide shift in diets—as incomes rise, people eat more grain-intensive foods such as meat, poultry and dairy products. Global meat production must nearly double by 2050 to meet demand. To produce one pound of meat requires more than seven pounds of grain in the grain-fed production systems common in the US.

**What are some of the most significant factors that might affect future food supplies?**

- **Threats of new plant diseases, insect pests or weed control problems.** The rate of increase in crop yields (bushels/acre) around the world is slowing. Contributing factors include new or re-emergent and highly-damaging plant diseases such as stem rust in wheat (providing one-fifth of mankind’s calories) or brown streak virus in cassava (the third largest source of calories for humans). Increased globalization and trade in farm products enhance the threats of new insect pests—the stink bug from East Asia was first identified in 1998 in Pennsylvania (where it destroyed 50% of the 2010 peach crop) and by 2011 had been found in 33 states! The battle against weeds in food crops is being made more difficult by growing resistance to formerly-effective herbicides such as Monsanto’s Round-up.
- **Supplies of farm land.** On the more positive side, the global supply of farm land is not likely to become a serious production constraint, although the most productive, most accessible lands are already being cropped. In the current global environment of tightening food supplies and higher prices, international “land grabs”—rich countries buying/renting farm land from poor countries—are becoming common.
- **Diversion of agricultural resources (land, capital, labor) to bio-fuel production.** Bio-fuels include ethanol as an additive to gasoline or oils from plant sources for diesel engines. Today about 40% of the US corn crop goes into ethanol, thereby pushing up food prices. US ethanol gains from extensive subsidies, now under attack in the US Congress. Environmental benefits are increasingly questioned. Brazilian ethanol derives from sugar cane, most on formerly under-utilized lands, and therefore competes less directly with the food chain for humans. Most bio-diesel comes from oil palm in Malaysia and Indonesia where it is encouraging the clearing of rubber trees and native forest.
- **Opportunities—and challenges--of genetically-modified (GM) food crops.** Reflecting significant reductions in production costs and yield gains, global production of GM foods continues to expand rapidly—and now involves 29 countries. 360 million acres, 15 million farmers. Opposition to GM foods, stemming from longer-term human health concerns, remains strong in some areas, particularly Europe. Although continued monitoring of this technology is warranted, extensive research to date has not identified health risks to humans. A current and important test case, now under review by regulatory agencies, involves the GM-salmon which promises twice the volume of meat per unit of time over traditional Atlantic salmon. GM food technology promises very significant production gains—a Monsanto spokesman suggests this technology could double average US corn yields in 20 years from the current 150 bu/acre to 300!

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- **The growing international scarcity of water.** Water issues are moving from economic and environmental considerations to matters of national security. Accelerating melting of Himalayan glaciers threatens irrigation water supplies for as many as two billion people. Growing competition for water in international rivers is leading to growing tension in several countries (Irawaddy—China and SE Asia; Indus—Pakistan and India; Jordan—Israel and Jordan; Nile—Ethiopia and Egypt, etc.) Because agriculture accounts for about 70% of global water use, improved efficiency in this use is critical to future food production. Closer to home, longer-term declines in e.g., water levels in the Ogallala Aquifer threaten the economic livelihood of a growing number of mid-western farm communities. Drip irrigation, some of it based on Israeli technology, with efficiency in excess of 90%, offers great promise over the standard center pivot systems in the US (efficiency in the range of 60%). Development of GM crops offering drought tolerance promises water efficiencies as well.
- **Climate change.** Growing environmental evidence and careful investigation by qualified climatologists strongly suggest that climate change is occurring and is already affecting a broad range of economic activities. Recent unusual weather events (record heat waves and drought in the US and Russia, heavy rains in Pakistan, etc.) cannot unequivocally be attributed to climate, but are consistent with informed expectations of climatologists. Nine of the 10 hottest Julys on record since 1880 occurred in the years since 2000. Atmospheric levels of carbon dioxide have increased by about 40% since the Industrial Revolution. The potential impact of climate change on global food production appears to be significant. Unfortunately the type, extent and geographic location of that impact are difficult to specify on the basis of existing knowledge.
- **Innovations in the global food economy.** Entrepreneurial innovation and capital investment, some with potential to enhance global food supplies, are re-shaping the world food economy. Five examples:
  1. **Detroit's urban gardens.** Economically-depressed Detroit now has 200,000 abandoned parcels totaling 30,000 acres. Unemployment is high; residents are looking for work—and locally-produced food! The new Detroit Home Gardens Program supports 1,000 gardens. Visionary entrepreneurs are planning to invest some \$30 million to expand such efforts.
  2. **Development of nutrient rich crops by Harvest Plus (HP).** HP is breeding crops that alleviate nutrient deficiencies in human diets. This includes introduction into Uganda and Mozambique of a sweet potato variety with unusually high Vitamin content; high Vitamin A cassava species in Nigeria; and, looking forward, pearl millet, beans and rice for India with extra zinc and iron content.
  3. **Con-Agra (CA) and sweet potatoes.** CA sees sweet potatoes, with higher levels of fiber, potassium, beta carotene and Vitamins B6 and C than russet potatoes, as a promising food product. Toward that end CA has entered into a multi-million dollar sweet potato development program with Louisiana State University. One research project, dubbed “Straighten Up and Fry Right” is to develop a more oblong shaped sweet potato more amenable to production of French Fries through machine processing.
  4. **Starbucks, Coffee and China.** Coffee consumption in China is expanding rapidly. Starbucks, with 800 retail outlets in the country, is in the forefront. In 2010 Starbucks entered a joint venture with Yunnan Province to expand production and processing of this highland Arabica coffee considered one of the best in the world.
  5. **Emergence of Brazil as an agricultural powerhouse.** Within the past decade grain production has increased by more than 75% to 150 million tons. Today Brazil is the world's largest exporter of beef, poultry, sugar and ethanol—and is second only to the US in soybean exports. Contributing factors have been abundant land, a generally-favorable climate and excellent supportive agricultural research.

**Can the world's farmers feed nine billion people? Some plausible conclusions.**

- Feeding nine billion by 2050 will be difficult, but not impossible.
- With slowing population growth, most incremental grain demand will come from more grain-rich diets—meat, poultry, dairy products.
- The major global constraint to increased food production will almost certainly be water.
- The most promising way to increase food production will be through better technology—particularly the expanded use of genetic engineering. Good, properly-funded agricultural research will be essential.
- The biggest future uncertainty will be the effects of climate change.
- The matter of adequate food for the world will remain of **fundamental importance**. As George Marshall, the “father” of President Truman's “Marshall Plan” said in 1947:

*“Food and insecurity are the worst enemies of peace.”*