Running on Empty

Technology is our only hope to meet global food demand, which will at least double over the next 40 years.

by ***Wes Ishmael***

"With one in six people going hungry, one child dying every six seconds and 80% of Sub-Saharan African countries facing higher food prices than a year ago, the poor and the hungry are facing one of the biggest crises in our lifetimes," said Josette Sheeran, executive director of the United Nations' World Food Programme (WFP) at a meeting of G8 nations last June. The G8 consists of the United States, United Kingdom, Canada, Japan, Germany, Italy, France and Russia.

"It is critical for the world to remember that hunger will have a permanent impact on children and we may lose a generation unless they have adequate access to nutrition during this crisis," Sheeran warned.

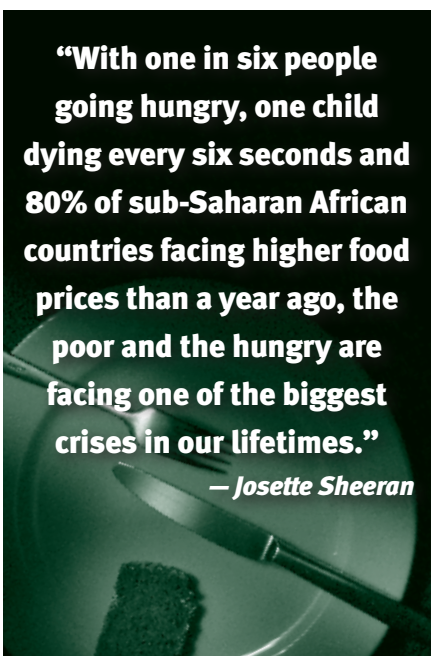
All told, the United Nations' Food and Agriculture Organization estimates there are 963 million hungry people in the world, most in developing nations.

It's not like agricultural production has been a slacker. Even with roughly 1 billion more people in the world than in 1996, there's more than enough food for everyone.

The root cause of so many doing without revolves around poverty, too many people with too little money and infrastructure to access the abundance.

Recent tough economic times have made it worse, especially in developing countries where 1.2 billion people live in poverty and 780 million suffer from chronic hunger, according to WFP statistics.

Even in well-heeled developed countries, though, today's abundance is not assured as tomorrow's birthright.



"The world faces the largest humanitarian food challenge in its history," says Alex Avery, director of research and education with the Center for Global Food Issues at Hudson Institute. "Over the next 40 years world food demand will at least double, and we have little new farmlands with which to meet that demand. We really have only more productive farming methods to use on our existing farmlands."

Part of that demand growth comes from the burgeoning world population. But Avery explained at the 2008 Beef Quality Summit that the global population is expected to peak at 8.5-9.5 billion people by 2050 — the current world population is 6.8 billion. Fertility rates are already below population replacement levels in the developed world.

Much of the explosion in food demand will come from expanding global wealth, the ability of more people to access more food and richer diets.

The current global recession notwithstanding, Avery explains Chinese meat consumption has doubled in the last 15 years, though they still consume less than half the animal protein of consumers in North America.

"All projections indicate Chinese meat consumption will double again," Avery says. That's just China, albeit the most populated nation in the world. In other advancing nations such as India — expected to have a larger population than China in several years — the story is much the same.

Multiple growth, limited options

So, the growing global population and its expanding affluence will test the limits of modern, high-yield agricultural production as never before.

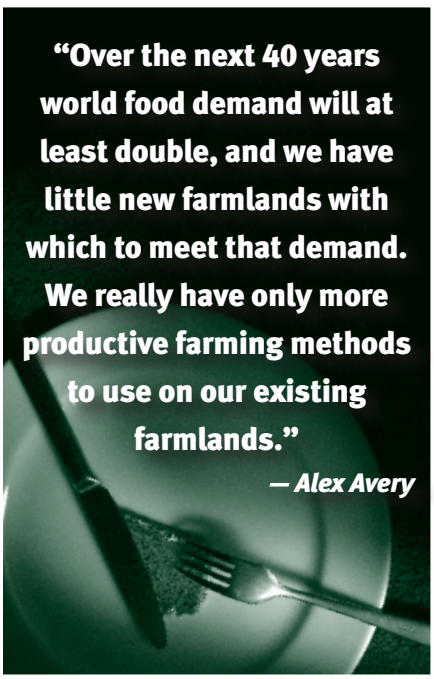
CONTINUED ON PAGE 248

Running on Empty

CONTINUED FROM PAGE 247

"There are only two ways to meet this growing demand. Take more land from nature or produce more food per acre on existing farmland," Avery emphasizes.

To this point in history, modern high-yield agricultural production has offered an unparalleled example of making more from less.



According to statistics from the USDA Economic Research Service (ERS), between 1950 and 2000 average corn yield grew from 39 bushels (bu.) to 153 bu. per acre; the average amount of milk produced per cow increased from 5,314 pounds (lb.) to 18,201 lb.; each farmer in 2000 produced on average 12 times as much farm output per hour worked as a farmer did in 1950. Development of new technology was a primary factor in this progress.

Beef cattle producers know all about adopting new technology to increase gains more cost efficiently. A few years back, scientists analyzed the economic, environmental and beef quality implications of pharmaceutical technologies for 50 years (through 2004). The researchers were Thomas Elam, president of strategic directions in Carmel, Ind.; and Rodney Preston, Thornton professor emeritus, Texas Tech University. In their insightful study, "Fifty Years of Pharmaceutical Technology and its Impact on the Beef We Provide to Consumers," they looked at pharmaceutical technology, as well as technology development in genetics, nutrition and grain crop yield. Among other things, Elam and Preston noted:

- Without technological improvements, the U.S. cattle herd required to produce the 2004 beef supply would nearly double to 180 million head, which would have major implications on land use and animal waste issues
- To provide additional pasture and feedgrains, that 180 million head of cattle would require additional land area equal to the combined acreage of Texas, New Mexico, Arizona, Colorado and Kansas
- U.S. beef production on a per-head basis has increased by more than 80%, making the U.S. the most efficient beef producer in the world
- While decreasing resource use, producers have increased total beef production from 13.2 billion lb. to 27 billion lb.

Consider cattle implants — growth hormones — alone. In a separate study conducted by Dennis and Alex Avery — Benefits of Growth Enhancing Pharmaceutical Technologies in Beef Production — the researchers note that it takes 1.64 acre days to produce a pound of conventionally produced grain-fed beef using growth hormones. It takes 1.99 acre days without growth hormones. It takes 5.04 days to produce a pound of organic, grass-fed beef.

For perspective, Avery adds, "If we had achieved only the per acre production of 1960, to meet today's food demand we would have had to plow an additional 15-20 million more square miles of land."

Meet Norman Borlaug

If you've never heard of a man named Norman Borlaug, you need to. He passed away last year at the age of 95, still an active professor emeritus at Texas A&M University. An Iowa-born plant breeder by training and education, he spent the better part of five decades developing and teaching high-yield agricultural production and conservation methods to people in developing countries. He received the Nobel Peace Prize in 1970.

In a 1997 *Atlantic Monthly* article, Greg Easterbrook wrote, "Perhaps more than anyone else, Borlaug is responsible for the fact that throughout the postwar era, except in sub-Saharan Africa, global food production has expanded faster than the human population, averting the mass starvations that were widely predicted — for example, in the 1967 best seller *Famine 1975!* The form of agriculture that Borlaug preaches may have prevented a billion deaths."

That brand of agriculture embodies the Green Revolution — using technology to increase cereal crop yields on a sustainable basis — that Borlaug helped precipitate. He was the pioneering director of the International Maize and Wheat Center founded in Mexico in 1943. At the time, Mexico was trying to figure out how to feed its growing population. Rather than merely teach Mexican farmers new methods — the original intent of the project funded by the Rockefeller Foundation — Borlaug and his crew innovated. One of his key achievements during this time, according to the Easterbrook article, was perfecting spring dwarf wheat. When the project began, Mexico imported half its wheat — a dietary staple. By 1956 it was self-sufficient; a few years later it was a wheat exporter.

This is the kind of thing Borlaug repeated by teaching high-yield agricultural production and conservation techniques to developing countries.

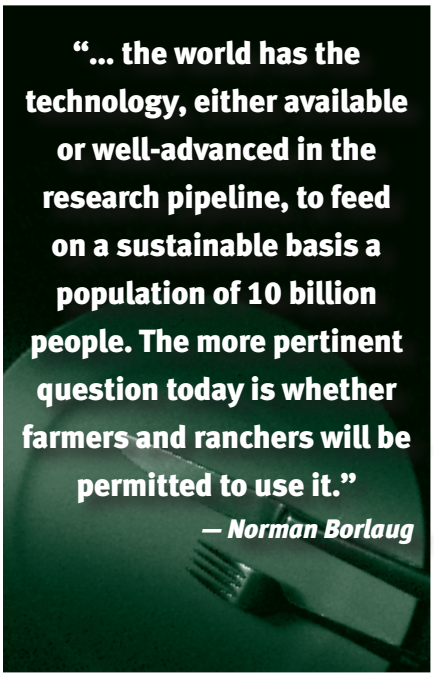
In a 2001 speech at Tuskegee University, Borlaug explained, "It took some 10,000 years to expand food production to the current level of about 5 billion gross tons per year. By 2025, we will have to nearly double this amount again. This cannot be done unless farmers across the world have access to current high-yielding crop-production methods as well as new biotechnological breakthroughs that can increase the yields, dependability and nutritional quality of our basic food crops."

During that speech, Borlaug credited Fritz Haber and Carl Bosch for what many consider the primary enabler of such dramatic increases in crop yields. They demonstrated and developed the industrial synthesis of nitrogen from its elements.

"It is only since WWII that fertilizer use, and especially the application of low-cost nitrogen derived from synthetic ammonia, has become an indispensable component of modern agricultural production," Borlaug explained. "Distinguished University of Manitoba Professor Vaclav Smil has estimated that 40% of today's 6 billion people are alive, thanks to the Haber-Bosch process of synthesizing ammonia."

Despite endemic poverty in the developing world, Borlaug and others of his ilk proved that technology can increase agricultural yield and feed more people with the same amount of land on a sustainable basis. Looking the opposite direction they proved how much land can be conserved.

"By increasing yields on the lands best suited to agriculture, world farmers have been able to leave untouched vast areas of land for other purposes," Borlaug said. "For example, had the global cereal yields of 1950 still prevailed in 1999, instead of the 600 million hectares that were used



for production, we would have needed nearly 1.8 billion hectares of land of the same quality to produce the current global harvest. Obviously, such a surplus of land was not available, and certainly not in populous Asia, where the population has increased from 1.2 to 3.8 billion over this time period."

In his Tuskegee speech, Borlaug said, "Agricultural researchers and farmers worldwide face the challenge during the next 25 years of developing and applying technology that can increase the global cereal yields by 50% to 75%, and to do so in ways that are economically and environmentally sustainable. Much of the yield gains will come from applying technology already on the shelf but yet to be fully utilized.

"Notwithstanding the problems of intensive agriculture, I often ask the critics of modern agriculture what the world would have been like without the technological advances that have occurred, largely during the past 40 years. In particular, we must also realize that world population has grown from 2.8 to 6 billion people over the past 50 years."

Advanced culture's unrealistic views

"When environmental activists are demanding that we increase the fuel efficiency of our automobiles, why are they also advocating a reduction in the land use efficiency of our farming systems (organic), especially when you consider no other human activity has as great an impact on our environment as agriculture?" wonders Avery. "Those are the tough questions environmental activists don't want us to ask."

The study cited earlier, comparing conventionally produced grain-fed beef to organic grass-fed beef serves as a crystalline example. Avery explains traditional full-fed grain-feeding systems reduce the amount of land needed to produce a pound of beef by 67%. Moreover, compared to organic, grass-fed beef production, the conventional grain-fed system reduces greenhouse gas emissions by 40%.

"Organic grain-fed beef produces 40% more CO_2 equivalent greenhouse gases per pound of beef than conventional grain-fed beef programs, primarily due to methane," Avery explains. "Organic grain-fed beef produces about twice as much enteric methane and methane is about 23 times more powerful than CO_2."

Plus, Avery points out, "If we had to go all organic, we would need the additional manure from 6-8 billion head more cattle to replace the synthetic nitrogen fertilizers with organic ones. The global cattle population is currently about 1.2 billion head."

So, with the use of growth hormones (implants) — proven safe by reams of scientific research — the conventional grain-fed cattle-feeding system provides more beef from less land with less pollution. And that's merely the impact of one technology used only in beef production.

"… While the affluent nations can certainly afford to adopt ultra low-risk positions toward new advances in agricultural science and technology, and pay more for food produced by the so-called organic methods, the 1 billion chronically undernourished people of the low-income, food-deficit nations cannot," Borlaug said. "With low-cost food supplies and urban bias, is it any wonder that affluent consumers don't understand the complexities of reproducing the world food supply each year in its entirety, and expanding it further for the nearly 80 million additional mouths that are born into this world each year?

"It is imperative that this serious educational gap in industrialized nations be addressed," he continued. "One way to do so, I believe, is to make it compulsory in secondary schools and universities for students to take courses on biology and food and agricultural technology."

Ironically, the U.S. at least, is doing just the opposite. The number of producers is dwindling. Funding for agricultural research and Extension is flagging. Interest in activist environmental and animal rights movements is growing, as measured by fundraising efforts.

"I said that the Green Revolution had won a temporary success in man's war against hunger, which, if fully implemented, could provide sufficient food for humankind through the end of the 20th century," Borlaug said. "I now think that the world has the technology, either available or well-advanced in the research pipeline, to feed on a sustainable basis a population of 10 billion people. The more pertinent question today is whether farmers and ranchers will be permitted to use it."

PHOTO BY KARL MUELLER

►The United Nations' Food and Agriculture Organization estimates there are 963 million hungry people in the world, most in developing nations.