

Elements of a Stable Food Supply

Tackling concerns of environmental sustainability and consumer trust to feed a growing world population.

Story & photos by **Meghan Richey**

If you had to double production by 2050 without increasing your environmental impact, could you do it? Could you do it in a way that would gain consumers' trust and confidence in your ethics and use of technology? Could you still be profitable? And even if you accomplished all three of those tasks, would it really create a stable global food supply?

These questions may be the challenges that agriculture now faces, as many experts estimate that twice as much food will be needed to feed the world's growing population by 2050. With limited resources, it will be even more important that animal agriculture continue to produce meat, milk and fiber in responsible and sustainable ways that meet consumers' expectations. Speakers at the 2011 annual conference of the National Institute for Animal Agriculture (NIAA) explored this topic and the growing necessity of involving consumers as stakeholders in food production.

An economist, an environmental specialist and an expert on consumer perceptions offered their expertise on three elements we must understand as we work toward creating a stable food supply — changes in population and economies, the importance of intensification when working with finite natural resources, and gaining and maintaining consumer trust:

► Professor of agricultural, environmental and developmental economics at The Ohio State University (OSU) and author of *The World Food Economy*, Doug Southgate presented information on demand drivers and supply drivers of the world food economy and projected how these will influence our future population.



- Associate professor and air quality extension specialist in the animal science department at the University of California-Davis, Frank Mitloehner spoke about food demand's implications for ecosystems and natural resource use.
- Representing the Center for Food Integrity, a nonprofit organization that seeks to build consumer trust and confidence in today's food system, CEO Charlie Arnot discussed how agriculture's engagement with

consumers influences our current and future freedom to operate.

Demand drivers

Demand for food is inarguably increasing, but by how much? And what factors can affect the

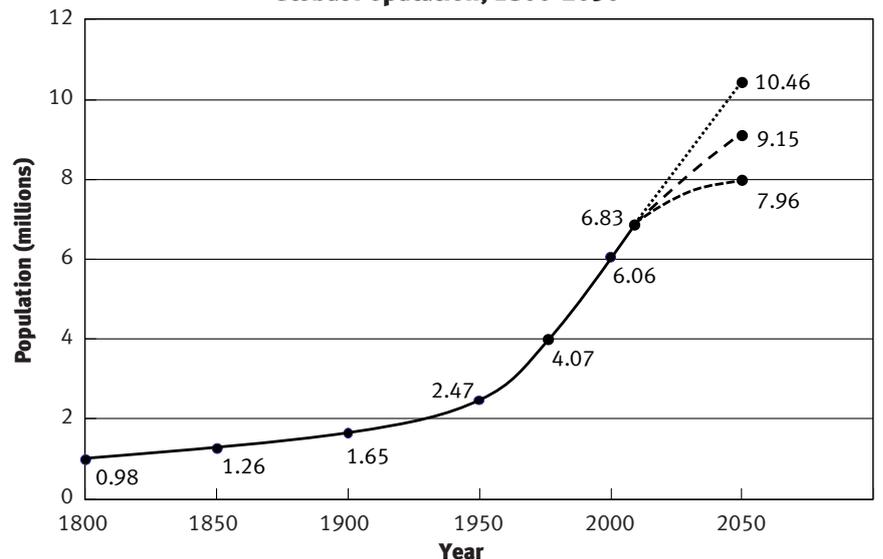
acceleration of food demand in coming years? Southgate narrows down the discussion to two factors: population growth and increased per-capita consumption.

"During the second half of the 20th century, the world experienced unprecedented population growth. The population doubled in less than 50 years," Southgate said. "That sort of growth had never happened before in history, and I can say with confidence that it will never happen again."

Southgate explained that population growth is "not about people suddenly breeding like rabbits. Rather, it's that people stop dropping like flies." As people escape from premature mortality, their standard of living and income trends upward. This leads to increased per-capita consumption, especially in impoverished areas. In particular, demand for livestock products —

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Global Population, 1800-2050



and feedgrains for the livestock — increase as incomes rise.

While high-income nations such as the United States have seen a decrease in growth of gross domestic product (GDP) per capita, much of the rest of the world has increased. For example, from 1965 to 1999, Eastern Europe and the former USSR had a growth in GDP per capita of 0%, but from 2000 to 2007 that figure rose to 6.1%. During that same period, eastern and southeastern Asia increased from 5.6% to 8%, the Middle East and North Africa increased from 0.1% to 3.2%, and sub-Saharan Africa increased from a contraction of -0.2% to growth of 2.8%.

Despite these sharp increases, neither population growth nor per-capita consumption is indefinite, Southgate quickly cautioned.

“Both will start trending downward, and this will affect our ultimate population at 2050,” he said. “Depending on the replacement level of fertility and female economic empowerment, we may see a global population of 7.96 billion, 9.15 billion or 10.46 billion at 2050.”

Replacement level of fertility describes the number of births per woman that must result for various rates of population change. At 2.1 births per woman, the global population will be stable, Southgate explained. Births per woman in all regions of the world are decreasing. Modest changes have occurred in high-income nations, falling from 1.9 births per woman in 1982 to 1.8 births per woman in 2007. However, more dramatic changes can be seen in all other regions of the world. For example, at those same benchmark years, births per woman in eastern and southeastern Asia fell from 3.1 to 1.9, in south Asia from 5.2 to 2.9, and in the Middle East and North Africa from 6.2 to 2.8.

Fertility levels are declining since female economic empowerment is increasing in many parts of the world. With greater economic empowerment and professional opportunities, women choose to pursue other activities besides bearing children.

“We’re all familiar with China’s one-child-per-family policy. Despite having no legal limits on births per family, Thailand experiences the same low birth rate as China, because Thai women experience greater economic empowerment than Chinese women,” Southgate cited as an example.

Depending on the rate at which fertility continues to fall and economic

empowerment continues to increase, we could see population contraction begin at 8 billion people in 2050, which would be the first global population contraction since the bubonic plague in the 14th century.

Supply drivers

Cereal grain yields have more than doubled since 1960, which has supported population growth, since 60% of the human diet is comprised of cereal grains when livestock feed is considered, Southgate said. Between 1961 and 2007, there was a 43% increase in land planted to crops, a 9.4% expansion in grazing land and a 10.7% increase in total agricultural land use.

Along with increased supply, grain prices have largely decreased in the second half of the 20th century and early 21st century, which has helped alleviate hunger and stimulated economies in developing countries. Yet, despite this increased supply, food prices are volatile, Southgate said, noting that there have been two major spikes in food prices in recent years.

“Prices have remained above the

maximum levels at which countries purchase food to replenish supply stocks. Since food consumption is inelastic to price, shortfalls in supply drive up price. Without supply stocks to cushion us, we’re exposed

Global consumer values include compassion, responsibility, respect, fairness and truth.

to price run-ups from short supply,” he explained.

Southgate says future challenges to the supply side of the food economy will come from climate change, technological improvements, biofuels development, and water scarcity and pricing.

“If I have one major concern here, it’s the use of water. The overuse of water, particularly in southern Asia, is driven by subsidized irrigation,” Southgate said, noting that 89% of water withdrawals in southern Asia in 2007 can be attributed to

agricultural use, while only 42% of water withdrawals in high-income nations such as the United States can be attributed to agricultural use that same year. Agriculture’s use of natural resources will be even more critical in the future.

Intensification minimizes impact

“Consumers and companies are starting to make purchasing decisions based on environmental impact, not just prices,” said air quality expert Mitloehner. As population, incomes and livestock product consumption all increase, natural resources remain finite.

“Our arable land cannot be increased. If we have a constant resource of land, but increasing demand for livestock products, how do we achieve the necessary production increase?” he asked, noting that experts around the globe now agree that intensified

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► “If the number of farms and level of production remained constant since 1950, there would be no food for 150 million Americans. Take the nine most populous states — California, Texas, New York, Florida, Illinois, Pennsylvania, Ohio, Michigan and Georgia — there would be no food for anyone there,” says Charlie Arnot, Center for Food Integrity CEO.

Then and Now



151 Million People 9 most populous U.S. states



- California
- Texas
- New York
- Florida
- Illinois
- Pennsylvania
- Ohio
- Michigan
- Georgia

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production is key. Developed countries are much more efficient in producing units of animal product per unit of environmental impact, he said.

"I can assure you from a scientific standpoint that the more intensive we are, the less environmental impact livestock production will have," he said. "This is contrary to what most of the U.S. population believes, but it is scientific fact. Even the United Nation's Food and Agriculture Organization (UN FAO) has changed its message recently to reflect this favor of intensification to meet demand while preserving natural resources."

This hasn't always been the case, though. In a highly publicized 2006 report titled *Livestock's Long Shadow*, the UN FAO wrote, "the livestock sector is a major player, responsible for 18% of GHG emissions as measured in carbon dioxide equivalents. This is a higher share than transport."

While the report did go on to conclude that intensification provides "large opportunities for climate change mitigation [and] can reduce greenhouse gas emissions from deforestation," that wasn't the message that was repeated by the media and engrained in public opinion.

"Meatless Monday proponents latched onto this 18% assessment of livestock's emissions and encouraged people to reduce consumption of meat and milk to have the greatest effect on GHGs," Mitloehner said. "But that figure is inaccurate. Major mistakes were made in calculating each sector's emissions, and the UN FAO has since accepted this shortfall in their report. Reducing meat and milk production will only leave people hungry and is not the answer."

Mistakes

The major scientific mistake in calculating figures in *Livestock's Long Shadow* came from using different assessment methods to evaluate the livestock sector and the transportation sector. For

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livestock, the authors produced numbers by adding up emissions from farm to table, including the GHGs produced by growing animal feed, the animal's digestive emissions, and processing meat and milk into retail products. By contrast, the transportation analysis did not similarly add up emissions of all production inputs. Instead it included only emissions from the fuel burned in powering vehicles and excluded the inputs used in vehicle production.

Another problem with *Livestock's Long Shadow* was that it failed to separate emissions by regions and, instead, provided a global average.

"It's important to know the FAO's assessment at 18% for livestock, although inaccurate, is supposed to be a global average, not one that can be applied to a specific country like the United States,"

Mitloehner said. In fact, the U.S. Environmental Protection Agency (EPA) calculates livestock emissions at just 3.4% of our country's total, while transportation produces 26% of our GHGs, and electricity produces 31%. By contrast, in developing countries where there are greater numbers of livestock than cars and net deforestation, the livestock sector can be responsible for as much as 90% of a country's GHG emissions, as it is in Ethiopia.

Mitloehner's scientific criticisms of *Livestock's Long Shadow* were published in the October 2009 issue of the peer-reviewed journal *Advances in Agronomy*. After reading his report, titled "Clearing the Air: Livestock's Contributions to Climate Change," the UN FAO "expressed its appreciation and accepted the inaccuracies of its 2006 calculations." The organization is now working on a new report titled *Shrinking the Shadow*, which will make clear that the FAO believes intensification of production is key to mitigating environmental effects.



"The FAO now says that production in the United States is a model for world production efficiencies," he continued. Simply put, we produce more meat and milk with fewer animals and inputs than other countries.

Consider a dairy cow in southern California. She produces 20,000 pounds (lb.) of milk per year, but just a few miles across the border, a Mexican dairy cow produces only 4,000 lb. of milk per year on average. Thus, it takes five Mexican cows to produce the same product as one American cow, Mitloehner said. The less-intensive Mexican system produces five times more methane than the American system because it takes five times more cows for the same level of production. More intensive production leads to fewer GHGs emitted, he said.

The next task is engaging consumers in conversations that help them understand that access to available technology enables intensification, which leads to sustainability. If consumers don't have confidence that modern production methods are in the global best interest, agriculture won't have legal and social permission to use that technology to meet the food demands of a growing population.

Consumers wary

"Consumers are wary of modern agriculture production methods. They say they trust farmers, but they aren't sure that what we're doing is farming," said Arnot, Center for Food Integrity. "They believe going back to the 'good old days' is the ethical choice, but is it?"

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Arnot said many producers and others in the food supply chain believe that agriculture has an image problem and that if we can change the public's perception of modern production methods they'll no longer harken for days gone by. But that's not actually the problem, he said. Instead of an image problem, agriculture actually has a trust problem. Consumers simply don't trust modern farmers.

► **Left:** "The FAO now says that production in the United States is a model for world production efficiencies," Frank Mitloehner said. Simply put, we produce more meat and milk with fewer animals and inputs than other countries.

“Even though we care and are committed to doing the right thing, we still struggle in building trust,” Arnot said. “The problem is that consumers ask farmers questions based on values, and farmers answer those questions with science and economics. We need to answer with values that match our consumers’ moral motivations.”

Building trust by sharing values

There are five global values that transcend geography and cultural differences, Arnot said. These global values are compassion, responsibility, respect, fairness and truth. Additionally, Americans have seven identified primary values, including personal liberty, responsibility to care for family, responsibility to care for self, work, spirituality, honesty/integrity, and fairness/equality.

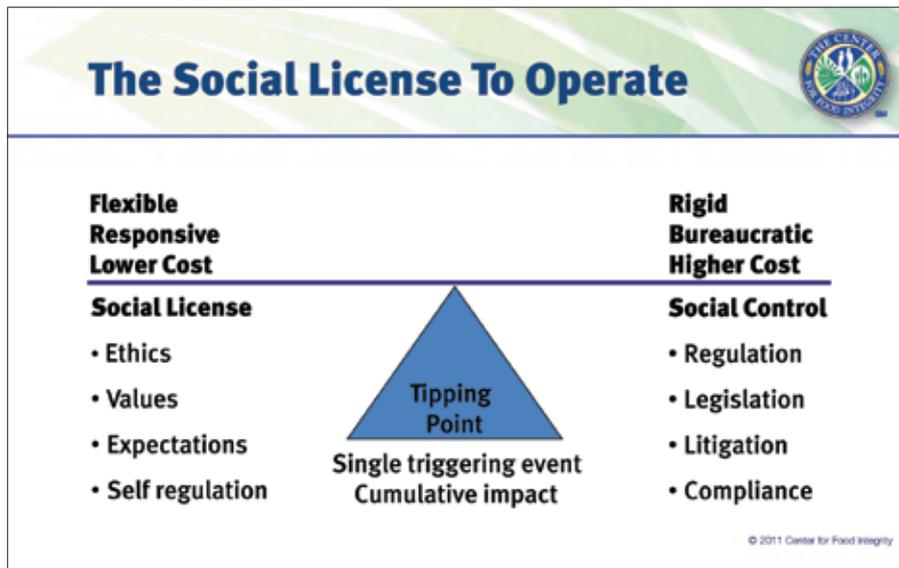
Consider the following example: A consumer asks a farmer, “Are you responsible in protecting the environment?” a question motivated by the universal ethical principle of responsibility. Agriculture’s most common answer to a question like that is, “Yes, it’s in our economic best interest to protect the environment,” an answer that reflects self interests rather than global values.

“When consumers speak, it’s important for agriculture to note the values that they are conveying. For them to trust us, they must see that we also have those same values. Data and dollars don’t win them over; values do,” Arnot said, noting that consumers’ confidence in our values are more important in determining trust than their perception of our competence. In fact, research has shown that perceptions of shared values and ethics are three to five times more important in building trust than demonstrating competence.

“I’m reminded of a Roosevelt quote, ‘They don’t care how much you know until they know how much you care,’” Arnot said, noting that people are more likely to act based on what they feel than what they know. “Agriculture needs to realize that demonstrating competence by giving figures and scientific data first doesn’t work. We need to connect emotionally with consumers first by sharing our values, then back that up with science next, if we want to protect our freedom to operate.”

Protecting freedom

When the public trusts that an industry’s activities are consistent with social expectations and the values of the



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community, there is an environment of social license, and producers are free to operate as they choose. This produces fewer formal restrictions, legislation and regulations. Industry is proactive via self-policing, education, best management practices (BMPs) and certification.

By contrast, an environment of social control develops when the public does not trust an industry, believing its actions have greater social cost than social benefit. There are more regulations, legislation and litigation, resulting in higher costs.

The tipping point between social license and social control can be a single triggering

event or the cumulative effects of numerous events. Arnot believes agriculture is walking a dangerous line and may soon experience even greater social control.

“What are you doing to earn and maintain consumer trust so we will have a climate of social license?” Arnot asked. He offered three suggestions:

1. Engage consumers and support choice in the marketplace.
2. Encourage people to learn more about policy decisions and their consequences.
3. Support responsible systems that allow us to produce food needed using fewer natural resources to meet growing demand.

“Agriculture must engage in conversations with consumers,” Arnot said. “If we endeavor to feed a growing population in a sustainable way, our conversations must cover three areas: ethical grounding, scientific verification and economic viability.”

The task of creating a stable global food supply may be daunting, but is certainly within our grasp. The “Father of the Green Revolution,” Norman Borlaug, is famously quoted as saying, “I now say 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 this new technology.”

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— Frank Mitloehner, UC-Davis