
Meeting Food Needs through Sustainable Production Systems and Family Farms

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Thank you for inviting me to speak about how the world's food needs can be met by agricultural systems that strengthen family farms, support strong communities, and protect the environment. It's always difficult to follow Dennis Avery. Dennis is very eloquent. He speaks with great certainty — which is in itself persuasive. And Dennis' message is implicitly appealing to a group of scientists and industry leaders. It is essentially that if we give scientists more money and industry and producers more freedom to do what they do best, the problems will be solved.

I don't believe it's that simple. And so my message, though sincere, may be less appealing.

But nevertheless, join me in exploring with an open mind some of the most vexing problems confronting agriculture and human kind, and probing the question of how agricultural science can achieve its full potential to contribute to the betterment of agriculture, agricultural communities, and the global society.

The question I will address is whether we can meet food needs with a sustainable family farm system of agriculture. I believe that it is just such systems that hold the greatest potential for food security. But ultimately, fulfillment of their potential depends on how we invest our agricultural research dollars.

The agricultural research and education system is not only a part of the solution, it is the most critical element of the solution. But — and this is perhaps the most important point I will make today — it can achieve that potential only if we create agricultural systems that address issues of fairness, opportunities, and justice; that provide genuine opportunity in agriculture and reduce poverty in agricultural communities; that feed hungry people; and that are sustainable, resilient, and environmentally responsible.

I will discuss three principles for meeting those lofty goals.

Principle A: There is no question that we must increase production over the coming decades, as Dr. Pinstrup-Andersen addressed yesterday. There will be many more mouths to feed.

But two caveats are in order. First, increasing production by itself will not solve the problem of hunger. In fact, if we focus on maximizing production at the expense of all other objectives it may in some instances exacerbate the problem. Second, American farmers should not count on a future of unlimited markets and prosperity based on exports to nations with increased numbers of mouths to feed. Productivity growth continues to out pace people's capacity to buy food.

The expectation that a growing middle class in the developing world will create huge markets for meat and feed grains is often oversold. Farmers have been promised that for decades and it has never materialized. The Asian economic crisis demonstrates just how shaky that promise is. And remember that with biotechnology, developing nations will have the potential to gain access to much cheaper meat- and dairy-type products using fermentation technology. I love the real thing. But since they've never acquired our taste for it, they may opt for cheaper substitutes. Don't bet the ranch on a booming export market.

Principle B: We must develop agricultural systems that create genuine economic opportunity in agricultural communities both here and in the developing world.

In the developing world, it is a matter of life and death. The Nobel Prize winning economist Amartya Sen observed that poverty, not absolute food shortage, has been the primary cause of starvation in the world — even during famines. The victims of starvation in the developing world are most often landless laborers or small farmers who have low and uncertain incomes and few assets. Even in famine, food was often available but they had no income to buy it. If we want to address hunger we have to address the ability to purchase food.

The fact is that the greatest hunger exists in the world's most agricultural societies — rural Africa and part of south Asia — where in many cases upwards of 60 percent of the population is rural and the primary source of employment is agriculture. These societies will remain highly dependent on agricultural employment for the foreseeable future.

For agricultural science to contribute to a significant reduction in hunger in these societies, it must create agricultural systems that improve economic opportunity for the rural people and thereby reduce poverty. That will not happen without strategic implementation.

In truth, much agricultural technology has reduced opportunity in farming and farm communities. Certainly, that has been the case in the United States. The most insightful analysis that I've seen on the impact of technological

change on U.S. farmers and farm communities is an analysis by Stewart Smith, on behalf of the Joint Economic Committee of the U.S. Congress. (Smith 1992)

Smith analyzed where value is added and to whom profit accrues in the U.S. food system. Not surprisingly, he found that the share of profit captured by the input sector (corporations that sell products to farmers) and the post harvest sectors (the processing, transportation and marketing companies) grew — at the expense of the share received by farmers. Most startling, Smith found that the farm share of the profit in the U.S. food system would fall to zero by about the year 2030 based on extension of the current trend line. That's not to predict it will fall all the way to zero, but it demonstrates how powerful this trend has been.

This is critical. Individual farmer operations have to get a little bit bigger every year to earn the same income. We also have to comprehend this if we want to understand rural poverty. When we consider poverty in agricultural communities the assumption is that it happens only in the developing world or the southeastern United States. But that is not the case.

In 1997, the nation's three lowest income counties were Nebraska farm and ranch counties. The average tax return in Arthur county Nebraska — the nation's lowest income county — reported income of less than \$10,000. More than one-third of the nation's 50 lowest income counties are farm and ranch-based counties in Nebraska and the Dakotas. Nebraska counties alone account for 10 of the bottom 50.

The Nebraska Rural Development Commission projects that without fundamental change in public policy the most rural communities in this state could lose 25 percent of their population over the coming decades. They would be reduced to repositories of the poor and aged, plus a few very large farms. This is not only an agricultural issue. Many of the poorest in farm communities are non-farmers. We need rural development programs that address their needs.

But make no mistake. It is also an agricultural issue. These communities are highly dependent on agriculture and their fortunes reflect the declining farm income. Contrary to many generalizations about farm income, in this region the incomes of middle size farms that rely on farming for their livelihood are well below national averages.

Future developments in the seed industry may exacerbate the declining farm share of profit in the food system. Iowa State University Economist Neil Harl recently sketched a potential scenario for evolution of the seed industry and agriculture. (Harl 1998) He foresees the possibilities of a very small number of firms gaining control of elite genetics with superior end use characteristics and then extending their control over markets for both inputs and grain, thus retaining ownership throughout the production and marketing process. Corn and soybean farmers would become like contract poultry growers. They would receive a fee for field operations to grow company-owned grain, using company owned inputs following company instructions.

Under this scenario farmers would add even less of the value to food and receive less of the return. Their role would perhaps involve lower risk, certainly lower management, and correspondingly lower return. Farmers would be reduced to custom machinery operators. They would need to cover ever-larger acreage's to earn middle class incomes. There would not be many farmers left.

This is just one scenario. It is not by any means inevitable. Whether or not it comes to pass, whether Stewart Smith's trend line continues, and whether the agricultural communities of the developing world are centers of starvation depend in large part on us. Today's trends are not inevitable. They are the result of decisions made by people that can be reversed by people. We can exercise choice.

Principle C: If our goal is to prevent hunger, we must develop production systems that are resilient, environmentally responsible, and capable of sustaining production in the face of unforeseen developments. If we develop technologies that maximize production under current or predictable conditions, but leave us with a fragile food system vulnerable to failure in the face of unforeseen circumstances, we will have built a "house of cards."

The world's food system faces profound challenges. In many parts of the world soil is eroding at rates exceeding new soil formation. We continue to threaten the long-term productivity of the world's fisheries due to water pollution, some of it attributable to agriculture.

We will, for all practical purposes, run out of oil during the next century. We face climatic uncertainty. Most scientists believe the globe will warm, extreme weather events will become more common, and rainfall patterns will shift as atmospheric concentration of greenhouse gases increase. Even if you discount the greenhouse effect, that does not eliminate climatic uncertainty. Climatologist recently reported research demonstrating that mega droughts — lasting 20–30 years — regularly swept the American West and Great Plains as recently as 400 years ago and could do so again.

It's not just climate. Nature in all of its aspects is unpredictable. It's true of pestilence and disease, as well. We cannot predict what nature will throw at us.

For that reason, it is risky to create food production systems of great uniformity. Diversity reduces risk. But industrialization of agriculture is all about uniformity. First, we reduced cropping systems and species diversity. Then we narrowed genetic diversity, a trend likely to be accelerated by biotechnology. In the final stages of industrialization, we are adding management uniformity. The classic example is poultry production. Integrators enforce uniform production practices for genetically uniform birds in uniform buildings — a system spreading throughout agriculture.

Uniformity is often cited as the rationale for industrialization — that consumers and end-users demand a uniform quality product that family farmers won't provide. I don't buy that. If packers and food processors want

farmers to provide crops and livestock with different traits, there is a proven way to accomplish that in an open market system: pay for it and discount the undesirable. Furthermore, consumers are demanding variety more than uniformity. In my judgment, the driving force behind industrialization is not consumers but rather agribusiness corporations exercising their economic power to reduce risk and uncertainty by gaining control over and locking in place supplies and markets.

The core point is that the ever more uniform food system created by industrialization is an ever more fragile system. Nature is unpredictable. It is foolhardy to put “all of our eggs in one basket.”

WHAT TO DO?

What steps must we take in agricultural research and education to develop secure and resilient food systems that create genuine opportunity in farm communities here and abroad, protect the environment, and meet the world's food needs?

First, we must secure the capacity for public good research. There is a place for profit driven research, but it will never meet all of the world's needs.

It will not meet the needs of the poorest farmers in the developing world for improved varieties, especially those who depend on crops for which there is not a large market like cassava and edible beans. They do not constitute a lucrative seed market.

The developing world needs research centers producing publicly available varieties available at a reasonable cost. It needs education programs responsive to its crops, its needs, and the circumstances of its most vulnerable farmers and rural people. It needs farming systems that increase both productivity and the incomes of rural people, if hunger is to be reduced.

We need a balanced approach that utilizes production-enhancing inputs within the financial reach of small farmers, but places at least equal emphasis on utilizing more of farmer's skills, management, and labor to expand income earning opportunities. As the richest and most powerful nation in the world, I believe we have a moral responsibility to help less fortunate nations develop that capacity. I also believe it is in our long-term interest. As long as the developing world produces a surplus of poor, hungry, desperate people, willing to work at “dirt-cheap” wages, real wage levels and living standards for working people in this country will fall.

That includes family farmers. As long as corporate farms can obtain their labor at poverty-level wages, it will be difficult for family farmers to pay themselves a middle class income for their own labor and to compete.

The profit-driven system will also not meet all research needs in the United States. It will not provide farmers with knowledge and production systems that enable them to reduce capital and input costs and increase their share of the profit in the food system. That does not create a product for sale. It is essential

that we provide the necessary public funding to maintain a strong public research and education system to do public-good research.

But it is equally essential that public institutions resist pressures to allow their research agendas to be set by profit opportunities — in pursuit of royalties and private contracts. Public institutions must serve the public good. If they fail that mission, they will ultimately undermine their reason for existence and threaten their tax support and their very survival.

To more effectively pursue public goods, we must change the focus of much of our public agricultural research. To create the economic opportunity that will allow the rural poor in the developing world to feed themselves and family farmers and farm communities in the U.S. to prosper, public research institutions must help change Stewart Smith's trend line. We can do that.

The trend of farmers and farm communities receiving an ever declining share of the profit in the food system reflects, in part, choices we have made about how to pursue efficiency through agricultural research. To a great extent, we have focused on developing expensive new products for the input sector to sell to farmers — to enable fewer people to produce the nation's food — and shift farm profits to the input sector. That is not the only option.

The alternative is pursuing greater efficiency in the food system while enhancing opportunity in agricultural communities. This can occur by developing the knowledge and production systems that enable farmers to more effectively use their management, skilled labor, and, perhaps in the developing world, unskilled labor to enhance the volume and value of their output and/or reduce their capital and input costs.

I am not suggesting low-tech agriculture or even low-input agriculture. Rather, I am suggesting a knowledge and management intensive system of agriculture that makes greater use of human input to both increase production and moderate capital and input costs. One participant at this meeting made a most insightful comment when he said that farmers are well paid only when they have leverage.

Research focused on developing new products for farmers to buy increases the leverage of the input sector. Research that focuses on enhancing farmers' management increases farmers' leverage and returns.

The hoop-house for hog production provides an excellent example of how agricultural research can enhance farmers leverage and returns. The hoop-house is a low-cost technology developed in Canada. It has a four- or five-foot wooden wall on which rests a half circle steel hoop, covered by a durable plastic tarp. Hoop houses are deep bedded typically with straw or corn stalks.

Hoop-houses require about one third of the capital of total-confinement hog-finishing systems. They require more management and more skilled labor. Because they do not provide a controlled environment, they require the daily presence of a highly knowledgeable and motivated manager who understands hogs and is able to exercise judgment. That is the strength of the family farm.

Although we have spent hundreds of millions of public dollars to refine and perfect total-confinement systems, and virtually nothing on hoop-house type systems, it is most remarkable that they are roughly comparable in total-cost of production.

But there are two key differences. First, the hoop house is most cost effectively applied at a very modest scale of about 200 head. Second, when a farmer sells a hog out of a hoop house more of the check remains in his/her pocket to compensate for his/her skills and management; and less goes to pay off a note on a confinement building.

If we had invested the same research resources in these types of systems that we invested in total confinement, family farmers would be beating the corporate giants and the industry would look very different.

In crop production today, our first impulse is to seek a solution to every problem utilizing new genetics thereby reducing the need to address the problem by managing the farm as a system.

Assuming that an approach using new genetics succeeds, the new genetics is probably privately owned by, for example, a seed company that will capture the associated profit, not the farmer. To the extent privately held genetics provide a substitute for farm management and skilled labor, they shift profit and opportunity from the farm sector and reduce family farm opportunities. Farmers' leverage is reduced.

In my judgment, we have over emphasized genetics and under emphasized systems science in agriculture research. We have severely under invested in basic research on agroecology — to gain understanding of the interactions between living-organisms in agricultural ecosystems — and how they are affected by farm management.

It is that kind of systems research that can provide farmers the new knowledge to manage their farms in ways that minimize pests, nutrient shortages, and other stresses that limit yield or require use of expensive inputs.

If our goals are to enhance production, increase farm opportunity, and create resilient farming systems, we should start first with research on diverse, management-intensive, environmentally-sound farming systems that enhance farmer's share of food system profit and then determine how traditional and transgenic plant breeding can strengthen those systems.

There is a great need for improved varieties of cover crops, rotation crops, crops better suited to cultural weed-control — for example faster germinating and emerging crop varieties. All could improve farm resiliency, productivity and profitability, but they have largely not been addressed.

The research and education system can also provide a great service by helping family farmers develop the knowledge, skills, and markets to respond to new consumer demands for value-added products. Markets are becoming segmented. Consumers are willing to pay a premium for food with unique attributes including food produced in ways that they support.

A recent nationwide consumer survey found that half of consumers are willing to pay some premium for food produced in an environmentally responsible manner.

Let me share an example. Networks of family farmers in Iowa are earning substantial premiums on hogs delivered to Nimon Ranch, a California food company. By meeting taste standards, producing out of confinement, and following guidelines for humane treatment of their animals, they earn substantial premiums and are protected by a price floor many times higher than the cash market prices for hogs at its lowest level last winter.

They are changing our paradigm of value-added. Value-added is no longer something that necessarily happens in a factory after the product leaves the farm. Farmers on the farm can add value by producing in ways that make their products worth more to consumers. That is leverage.

How we respond to the opportunities presented by these emerging markets will to a great degree determine whether we have family farmers in future generations. Returns for production of undifferentiated commodities are low. They are especially low for family size farmers, because they don't operate on a level playing field.

A large corporate hog farm, for example, receives more for the same quality hog than a family farmer does because it has the power to command a premium. We need to address this inequity through state and federal laws designed to ensure fair market access, such as those passed by state legislatures in Minnesota, Missouri, Nebraska, and South Dakota this spring. But we also need to develop higher-value markets and capture them for family farms.

The questions of how we produce food, who produces it, and who owns the land are fundamental social issues. For much of the developing world it is an issue of life and death. The concentration of land ownership and wealth in the U.S. present fundamental social issues that we ignore at our peril.

The share of our nation's wealth held by the richest one percent of Americans is approaching 50 percent, more than double that in 1976. In agriculture, farm communities are sinking into poverty, corporations are consolidating control over animal agriculture, and we teeter on the edge of the greatest period of land consolidation in the history of America.

These things matter. Historians Will and Aries Durant describe a recurring historical process in their book, *The Lessons of History*. A civilization arises, wealth concentrates, and if left unaddressed, the civilization collapses as too few people retain a stake in the society to sustain it.

The Durants wrote that when the invading armies that toppled the Roman Empire entered its hinterlands, they were surprised. They expected to be met by resistance. But they were met not by resistance, but by slaves listlessly tilling the soil.

My point is not that this is a critical military issue, but rather that no society can sustain itself and thrive if its people do not have a stake in it. People who feel

a stake in society contribute to society, build communities, give back, and take responsibility for the society. We are producing a society with many people who don't have much stake in it — and it shows.

For those who say that this is not the concern of the land grant college system, I say read your history. The grant system was a great social experiment with a great social mission. Yes, the system was to make two blades of grass grow where one grew before. But also as recorded in the congressional debate over its origin — it was created to improve the lives of rural people — especially small farmers and the disadvantaged. It was to make education available — not just to the elite — but to the sons and daughters of farmers, mechanics, and ordinary people.

We must regain our sense of a social mission. We must aim at nothing less than providing society with the knowledge and resilient food systems that meet the food needs of a growing population. We must develop systems that protect our environment, that reduce hunger and increase opportunity, and that revitalize rural communities.

Let's accept that as our mission, let's embrace it, and create the nation's best institutions in meeting this challenge.

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Biotechnology and Mature Capitalism

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INTRODUCTION

Most of the biotechnology products on the market today are pharmaceuticals. They have been introduced with relatively little opposition or public debate. However, agricultural products produced from biotechnology seem to have been surrounded with controversy from the outset. It is this segment that I wish to address.

The recent ban on some of these food products by countries that are major purchasers of food commodities from the United States has created major confusion in farming communities. Farmers were promised that products containing new genetically modified organisms (GMOs) would provide new opportunities for them and would increase profits for farmers willing to embrace them (*Doane's Agricultural Report* 1999). However, between the time farmers purchased their seed and the time they had it planted in the spring of 1999, some learned that certain processing firms would pay a premium for non-GMO products. Others discovered that in receiving certain GMO seed, they had to sign a contract stating that they were responsible for guaranteeing that the products of this seed would not get into the stream of products (or by-products) heading to Europe. All this happened at a time when the world seemed to be awash in grain and oil crops as reflected in commodity prices below the cost of production. These issues were added to the farmers list of negative reactions to the \$6.50 technology fee added to each bag of seed purchased, and to Monsanto's hiring of a detective firm to enter farmers' fields (as allowed by the contract a farmer had signed) to take a tissue sample to ensure the company that the farmer had not planted in the current year seed saved from the previous year. By the summer of 1999, some of the early adopters were wishing they had never heard of these new products.