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INDUSTRIALIZATION OF HEARTLAND AGRICULTURE

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FOREWORD

Farmers in America's Heartland are paying increasing attention to emerging trends of consolidation of farm firms, contractual and ownership linkages across input suppliers/processors and farm firms, and strategic partnering across the stages of food production, processing, and marketing. These trends promise to reshape much of agriculture production, and the firms that do business with farmers.

The trends hold different meanings for different people. To some, they signal the end of open price discovery and a fundamental loss of competition in the agriculture and food sectors of this country. To others, the trends indicate a growing loss of independence by farmers and small town business persons. Yet, others see the loss of competitive position by farmers, fearing they will become no more than hired hands on their own land.

Still others see in the changes underway a continuation of long standing trends of at least the past half century. Many see opportunity for new products, new business relationships, and greater profitability, as both agricultural structure and longstanding cultural/business practices change to meet the needs and demands of customers.

This conference brought together a large group of persons from across the Nation's Heartland whose views spanned the spectrum of reaction to industrialization of agriculture. Along with a roster of nationally prominent economists and sociologists, government officials, farmers, business persons and community leaders, those in attendance explored and evaluated the forces behind this industrialization. They considered impacts of those trends on their farms, businesses, community institutions, and customers. Finally, they discussed what their response to these trends might logically be. They sought constructive opportunities for progress, equity, and enlightenment within the ongoing change.

Not every one reached agreement on either the sustainability or the correctness of the current forces of change or on the appropriate response by farmers, business persons, communities, and governments. But everyone gained an improved understanding of industrialization in agriculture, and of the issues embedded in that change. They concluded they could find opportunities within change and could shape the impact of the changes underway. Finally, they gained a better understanding of what will be required to shape their future and to capture opportunity out of the changes underway in Heartland agriculture.

We invite you to thoughtfully read the papers and discussions contained in this proceedings and to join the attendees of this conference in shaping, in a positive way, that part of the Nation's food and fiber system and its communities over which you exercise authority and responsibility.

We gratefully acknowledge the financial support of the Farm Foundation, the North Central Public Policy Education Committee, the supporting agencies of USDA, the Midwest Association of State Departments of Agriculture, the program presenters, and others who provided assistance and collective wisdom in helping make this conference a success. A special thank you is due Sandy Osborne, Norma Ackerson, and Carol Jensen at NDSU whose careful attention to detail made sure the arrangements were effective and this proceedings was put together in a timely manner.

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Fargo, North Dakota

December 1995

Chapter 1

Opening Remarks and Welcome

The Honorable Gene Hugoson, Commissioner
Minnesota Department of Agriculture

It is indeed an honor and a privilege to be here today, first of all, to welcome you to Minnesota. It is always good to have our friends from North Dakota bring a little money into Minnesota to help with the economy. So, on behalf of the governor of the State of Minnesota, Arne Carlson, and the administration, and, really, the people of Minnesota, we do welcome those of you who are visiting our state. For those of you who are from Minnesota, we are just glad to have you here as well.

This conference is about change. There are some changes that have occurred in the very recent time. Number one being you are stuck with me up here instead of the keynote address person who you were initially slated to have. I am very familiar with change in the sense that I have been on the job as commissioner of agriculture now for about one week. So this is new for me, too. Initially, I was to come and just welcome you to the conference. Now we're looking at a little bit more.

But really, when you're talking about change and the things that are happening in agriculture, that's something that's very, very important. When you look at what's happened in agriculture going as far back as recorded history, I think you'd have to admit that there has always been change going on. The rate at which that change occurs is what makes the difference. Oftentimes, that rate of change is what causes the conflict that develops between the forces that are involved in the changing process.

Change can be difficult to accept, difficult to deal with; and it doesn't have to apply just to agriculture. Let me give you an example. This little clipping refers to an event that happened back in 1870 involving a Bishop in a mainline denomination (I don't know if it was Presbyterian or not, but one of the denominations) by the name of Milton Wright, and he made this comment. "The millennium is at hand. Man has invented everything that can be invented. He has done all he can do." This was in 1870. However one of the individuals at that conference took exception to that statement, challenged the good Bishop, and said, "I don't believe that. I believe in the next 50 years we're going to see tremendous change taking place. In fact, there are going to be new inventions that we can't even imagine yet today." And the Bishop asked him, "Well, what are you referring to?" "Well," said the challenger, "I happen to believe that within the next 50 years, man is going to learn how to fly." The Bishop said, "This is blasphemy. Don't you know that flight is reserved for angels." Well, no more was said at that particular conference, but Bishop Wright had two sons, Orville and Wilbur, and talk about change coming back to haunt the very person who said we have everything that we need, everything will stay the same. Certainly, everything will not stay the same.

When we deal with the issue of change, I think you would have to admit there is a broad spectrum in terms of how people deal with change. On one extreme, you have those who advocate change. They live for it. They enjoy it. They thrive on it. In fact, they do everything that

they can to encourage it. On the other hand, the other extreme, you have those who would resist any kind of change. The status quo is just fine. Let's keep it. And, in fact, they will do everything they can to resist change because to them change represents all kinds of horrors, whatever they might be, whatever the issue. I would dare say that for most of us here, we are somewhere in that middle range. We see change happening. Some of it we like; some of it we don't like. But I think that we have to admit that change is going to take place whether we like it or not. The same thing applies to agriculture.

Is there change going on in agriculture? Absolutely! We could look at many different areas or many different aspects of agriculture and admit that change is taking place. Some statistics that are available from our own state Department of Agriculture show that the number of farms has declined so that today we have only about two-thirds the number of farms we had 25 years ago. But along with that change in the number of farms, of course, the size has changed. It's gone from about 255 acres per farm up to 345 acres per farm. Recognizing the diversity that you have in a state like Minnesota, from small hobby farms around the Metropolitan area to some of the large grain farms that exist in the Red River Valley, you recognize in some areas, of course, that change is going to be even more dramatic. But also interesting to note is in that 25-year period, we've seen a significant drop in the number of available acres for agriculture simply because of the urban expansion that has taken place. So during that 25-year period, we've seen about a million acres come out of production to be gobbled up by urban expansion.

One of the areas that is going through some significant change and is causing some significant conflict is livestock expansion. There are questions about the environment, social issues, and urban versus rural conflicts. These conflicts can pit neighbor against neighbor. There are some very real, dynamic changes that are taking place. Yet, when you look at the hog industry, for instance, one that has perhaps been the most controversial, at least in our state in the last few years, we've seen that the numbers of hogs in the last 40 years has increased insignificantly. We've gone from 7 million hogs 40 years ago up to 8.3 million hogs today. Now that's an increase, but not that big an increase when you consider the 40-year time period or when you consider what is happening in some of the other states further south.

Contrast that with what's happening in the dairy industry, and we've seen in that 40-year period the number of dairy cows has actually been cut in half. But at the same time that the number of dairy cows has been cut in half, the production per cow has doubled. And so I think it’s interesting that the average production per cow in Minnesota today is 15,000 lbs of milk, the person who is able to get 20,000 lbs of milk is going to be at a significant advantage. That is one of the areas on which I will touch later.

Is change good? I think we could go around the room, and we could have a different answer from everyone in this room about whether the change that is occurring in agriculture is good. As a person who was born and raised on a farm, has spent a majority of my time on the farm, and has been in the state legislature the last nine years, I have witnessed quite a few changes during that time. Often those folks who are most against any change remember some of the aspects of agriculture as the way they used to be. They remember how nice it was to visit grandfather and grandmother's farm and see and enjoy the nice way of life that existed there. Yet,

when you stop to think about it, those of us who have lived through some of that change, I don't think there is one of us who would like to go back to every aspect of the way things used to be.

I attended a conference about 4 years ago at which one person said all the conflict that exists on the farm today could have been avoided if the skid loader had not been invented. If we still relied on the pitch fork for what was going on, we wouldn't be having some of the discussion that we are having today. Now I would agree with him on that part, because if that's what we were still relying on, there wouldn't be very many people left in agriculture today. I came through that era when the skid loader made a lot of difference, believe me, and I think there are many people from my generation and younger who would not care to be in farming had it not been for the skid loader.

Bob Berglund, the former Secretary of Agriculture, commented that when his father had one of the first tractors in his county, he was greeted by a lot of opposition by people in his area because this was going to change the way farming took place. They were absolutely right. It did change the way farming took place. Interestingly, some of the biggest opponents to that tractor, to that technology, were the horse traders. And when you stop to think about it, you can understand why because what was good for one group of people was not good for another group of people. And, much of the conflict that has existed in rural communities today has been of a similar nature.

It really doesn't matter if you are talking about changes that have come about in agriculture because of hybrid seed or some of the other things that we have out there. Change has not come without controversy. Yet some of the changes that are happening provide some excellent opportunities for what is going on in the rural area.

The very technology that was in the news just recently, which was being touted that because of American ingenuity, we were able to locate a downed pilot in Bosnia; and because of the satellite tracking system, the rescuers were able to go in there and pull that person out. It's the same technology that is being used in agriculture today. It gives farmers the ability to fertilize and use chemicals based on the fertility and the special needs of a given piece of ground. Technological advances have happened throughout agricultural history. They will continue to happen.

Yes, we do have a different lifestyle on the farm today than we had 40 to 50 years ago. In fact, you could go back 200 years or more in the history of this country. We have seen a lot of changes take place. During the next day and a half, you are going to be discussing some of these changes. And like many of you, there are some changes out there I don't like to see. On the other hand, I think we need to be realistic and recognize that even though there are some things happening that we perhaps don't like, we need to help rural Minnesota make some of those changes and to help rural America adapt to some of those changes, so that we aren't left behind with everything that is going on.

Often I hear the comment that we need to be doing everything we can to save the small family farm. Now that's a noble goal; but again, everything is changing in the world. I think it is unrealistic to assume that we are going to have the same number of family farms at the same size 10 years from now that we have today. Because if you look at main street America, actually urban

America, nothing is going to be the same as it is today 10 years from now. I think what we need to concentrate on instead is how we can save farm families and enable them to exist in the environment in which they are struggling at this particular point. There are many opportunities that I think we can collectively work on together to do everything we can to help American farm families adapt to that change.

I wish you well at this conference, and I look forward to visiting with you later. Thank you very much.

Overview

Dr. Fred Woods, Public Policy Specialist
Cooperative State Research, Education and Extension Service

Dr. Stauber sends his regrets. He actually did not know that he wasn't going to be here until 3:30 p.m. or so on Friday afternoon when he learned his presence was required at a Senate Agriculture Committee session today. You would think that they surely are better organized than that back there; well, they aren't. As a matter of fact, several years ago, someone was talking to the chaplain of the Senate. And he asked the chaplain if, when he started each day's session with prayer, he prayed for the senators. And he said, "Well, no. Knowing this lot, I pray for the country." Perhaps this would be good advice for the present chaplain of the Senate.

This morning the Senate Agriculture Committee is marking up the research and extension title of the farm bill. All of us here who labor in the vineyards of the land grant system appreciate Dr. Stauber's not being here and, indeed, being there looking after our best interests. I'm certainly very pleased that he is there. I think that he is doing a good job for us, and it is unfortunate that we won't have the pleasure of hearing him today.

I'm supposed to give a national perspective for this Conference, but there is a problem with national perspectives. It's like a person with one foot on a block of ice and the other foot in boiling water. When you take his average temperature, everything looks okay. And that is one of the problems that we get into when we try to deal at the national level with changes that are occurring at regional, state, and local levels. Nationally, the statistics for agriculture are generally favorable. They show that what we have always subscribed to as the "family farm" is doing quite well, thank you. According to the latest Census of Agriculture, about 85-86% of farms are sole proprietorships. That's the first indicator of what a family farm is. Of course, there is no national consensus on a definition of "family farm." About another 10% of farms are partnerships and corporations, which have been rocking along around 3 to 3.5 for years, have climbed a percent or so; but the vast majority of these are family operated as well.

We hear a lot of concern expressed about how much older farmers are getting; but, if you look at the national statistics, they're not getting much older. The average age of farmers today is about 53 years. In 1959, it was 50.5 years, so they haven't gotten that much older in the last 35 years.

Average annual farm income keeps holding up pretty well. It runs about $200 billion a year with about $175 billion from sales of crops and livestock, $10 billion in government payments, and $15 billion in nonmoney income. Production expenses are about $150 billion, leaving a net of $50 billion. In recent years at the national level, we have been paying more attention to the importance of nonfarm income. It's been there all the time; we just haven't been paying much attention to it. A lot of us are familiar with those statistics. They tell us that nonfarm income far exceeds farm income for a majority of our farmers. Indeed, roughly 1.5 million of our approximately 2 million farms sell less than $50,000 of products annually. All of us here are familiar enough with farming to know that with this level of sales, you're not going to have much net income; and, in fact, this group of farmers, 75% of our total, loses money farming on the

average. But they earn average nonfarm incomes of about $38,000. That's pretty good, especially when people from urban areas compare that with their own incomes.

At the other end of the farm-size range, when we look at the 37,000 or so farms selling $500,000 and over of farm products, their total household incomes average about $145,000 a year with net farm incomes of a little over $100,000 and $40,000+ of nonfarm income. So, nonfarm income is an important factor to all sizes of farms. Average household income for all U.S. households is about $41,500.

Of course, our official definition of a farmer is not very meaningful. It's anybody who sells or expects to sell at least $1,000 worth of agricultural products. That's not a very meaningful definition, but it's highly political. Just talk about changing it to make it more realistic (however you define realistic) and watch the firestorm you run into. Pride, politics, and funding formulas are all involved.

Of the 2 million or so farms in the country, only 54% of their operators consider themselves to be farming for a living. Forty-six percent say their principal occupation is something other than farming. They just happen to sell at least $1,000 worth of farm products.
Well, 1995 is a farm bill year; and despite the dire predictions about what is going to happen to the farm bill with all the budget cutting activity in Washington, it now appears that relatively modest changes are in store for the farm bill. I don't know how many trees gave their lives to produce all of the reams of paper that have been generated in publishing studies about farm bill alternatives and with lesser results.

In the final analysis, when this 1995 farm bill is passed, I predict it will be little changed from the 1990 farm bill. The changes factored in to accommodate necessary budget cuts won't be as major as many have predicted.

Another thing I want to mention is that we have heard an awful lot of talk from the experts about the declining political strength of farmers. I've been hearing that same argument ever since I was old enough to know what political strength meant. Well, at least, I think I knew what it meant. The "experts" just don't know what they're talking about! Agriculture came out probably better than any other segment of the economy or any other segment of business in terms of budget cuts this year. One of the strategies followed by House Agriculture Committee Chairman Pat Roberts to minimize agriculture's share of budget cuts was to point out to the Republican leadership that 33 of the 76 House Republican freshmen were from significant agricultural districts and needed a "farmer-friendly" farm bill to help their re-election chances. So, whenever you hear someone talk about the declining political strength of the farmers, just know that person really doesn't understand politics very well.

I figured I had to mention the farm bill since everyone expects someone from Washington to talk about that, but I don't want to give you the impression that the concerns that bring us together here will be addressed to any great extent in this legislation. We really expect too much from our "farm bills." Typically, we have tried to deal with all of the concerns and problems of rural America in the context of the farm bill and have wound up with a relatively minor "title" called "rural development" that hasn't really addressed these problems very well.

This typical approach may have been appropriate at one time when we had a relatively homogenous agriculture and when the purpose of the rural community was to service the folks who operated the farms and ranches in the surrounding area. But, that's not the case anymore. Let's just look at the things that concern us about the industrialization of agriculture. We are concerned about the importance of agriculture in rural areas, the impact of industrialization on local economies, and the impacts on quality of life in rural areas. These are not dealt with in the farm bill. We're concerned about the environment in terms of the effects of agricultural chemicals and animal wastes on ground and surface water quality and on air quality. These become especially critical where farming and suburbanization interface. But, this again is not addressed in the farm bill.

We're concerned about consumer supplies and prices. Although the range of consumer choice continues to increase and the cost of food as a percentage of disposable income continues to decline, some people nevertheless raise the concern that these trends may be reversed by continued agricultural industrialization.

We're concerned about marketing farm products. We're concerned about the marketing problems concentration brings with it. We're concerned about independent producers' access to markets for those commodities that are going into contract production; we're concerned about the possibilities for corporate control of over prices and quantities. Those things aren't dealt with in farm bills.

So, I think we have to change our way of thinking if we want to try to direct or manage change in any way. We're going to have to look beyond the context of farm bills and traditional farm policy analysis.

I think the land grant system can offer some help if people both inside and outside that system really want it to. As you know, the land grant system started out as the people's universities, and the research and extension components were charged with bringing the capacity of the university to the people and dealing with problems that people were concerned about. But, by and large, we have dealt primarily with the production of food and fiber, and we have largely ignored the "people problems" of agriculture and rural America. This didn't happen as the result of any conspiracy, but most likely because these "technical" issues were easier to address and also because we really couldn't figure out how to address these larger "people" problems. And up to now, the "people," our clientele, have let us get away with it. So maybe it's time for us in the land grant system to return to our original mission of being the people's universities.

So, we have come together here, persons holding a range of views about agricultural industrialization. Our task, in the words of the prophet, is to sit down and reason together and begin to explore ways in which we might "manage" or direct this change to maximize the positive aspects of industrialization and minimize its negative aspects.

All of us have our definite opinions about what's happening and what we should do about it. The late 19th century "philosopher," Josh Billings, said " it ain't the things that we don't know that trouble me so, it's the things that we KNOW that just ain't so." Now we KNOW an awful lot of things about agricultural industrialization, and some of them ain't so. We probably won't come out of here with a whole lot of answers as to what we should do or not do relative to the

challenges and opportunities that change presents. But, hopefully, we can agree on some of the problems that we need to address and to address some of things that we KNOW that just ain't so.

Thank you.

Chapter 2

Forces Driving Industrialization

Dr. Steven T. Sonka, Professor of Agricultural Management
University of Illinois at Urbana, Champaign

Introduction

My charge in this paper and these brief remarks is to address the primary forces of change affecting agriculture and rural America. To accomplish this daunting charge in the time constraints provided, I will focus more on understanding the root causes of industrialization and less on describing its specific symptoms.

The following remarks are divided into five sections. The first will define industrialization in both its business and emotional aspects. Then the role of change in market economies will be documented. This discussion will be followed by an identification of five driving forces within the Heartland agriculture today. Because industrialization is inherently a replacement for commodity agriculture transactions, the fourth section will contrast the driving forces for change with key features of the commodity marketing system.

The paper's final section will be a summary. To summarize the paper, I'd like to respond to a question that's been raised to me by numerous Heartland farmers over the last three years — Is the industrialization of Heartland agriculture inevitable? Evaluation of this question should set the stage for further discussions in this conference regarding challenges, opportunities, consequences, and alternatives.

What is Industrialization, Anyway?

It's interesting how quickly the phrase, industrialization of agriculture, has become a commonly used and accepted descriptor of the changes occurring in agricultural production and marketing. As is the case for many commonly accepted terms, each of us often has differing perceptions and associations with the term. However, we typically assume that our perception is basically the one being used by everyone else.

Consider, for example, the term quality as we think about the pork sector. In a room of producers, packers, and consumers, we're likely to find that "pork quality" evokes images that include leanness, taste, uniformity of color, consistency of size, absence of foreign objects (i.e., needles), and the extent of "moral" practices used in production.

Clearly, any effective discussion of enhancing pork quality needs to recognize and distinguish among these differing attributes.

Similarly, it's important that we address definition issues for the term, industrialization of agriculture. In a 1991 article in *Choices* magazine, Tom Urban provided one such definition:

> The process by which consumer's wants and needs are fed back to production and distribution systems to provide desired quality, availability and price.

This definition is informative because (1) it focuses on consumers, (2) it provides a perspective that extends beyond agricultural production, and (3) it explicitly includes quality as an attribute.

In a 1994 symposium, the Council on Food, Agricultural and Resource Economics provided a similar, but more extensive, definition:

> Industrialization in agriculture refers to the increasing concentration of farms and to vertical coordination (contracting and integration) among the stages of the food and fiber system. The merging system is expected to be highly competitive in global markets, more efficient, more responsive to consumer demands, less dependent on government assistance, and able to more rapidly adopt new technologies.

This perspective identifies two of the direct impacts of industrialization (larger farms and vertical coordination) and specifies economic and market effects expected.

Examining these two definitions, it's difficult to see how there could be any controversy regarding the desirability of industrialization (except maybe that the word itself evokes images of factories and smokestacks). If industrialization proceeds, however, significant changes in the framework of Heartland agriculture will follow. And, although no one may argue with the desirability of better serving consumers, there can be considerable controversy about the changes that are required to achieve that general goal.

Heartland agriculture and its predominant family farm structure evoke strong images and perceptions. These images almost always focus on the agricultural production unit even though, as depicted in Figure 1, there are numerous economic factors between genetic input providers and consumers. In Figure 1, there are dark heavy lines that separate the symbol for production agriculture, the barn, from the other sectors. We use those lines (1) to indicate the existence of commodity-type, short-term market transactions on each "side" of the farm gate and (2) to illustrate the perception of the independent family farm unit in Heartland agriculture.

From some perspectives, increased industrialization in Heartland agriculture attacks that very strong image of the independent family farm. {As is typically done, let's conveniently ignore the major interrelationships between government farm programs and the perceived independence of the family farmer in this discussion.} Using the visual tool of Figure 1, industrialization is in effect rubbing out segments or all of those dark lines around the agricultural production unit. And, in doing so, we perceive that some of the desirable features of the idealized independent family farm are threatened.

The Food and Agribusiness Sector

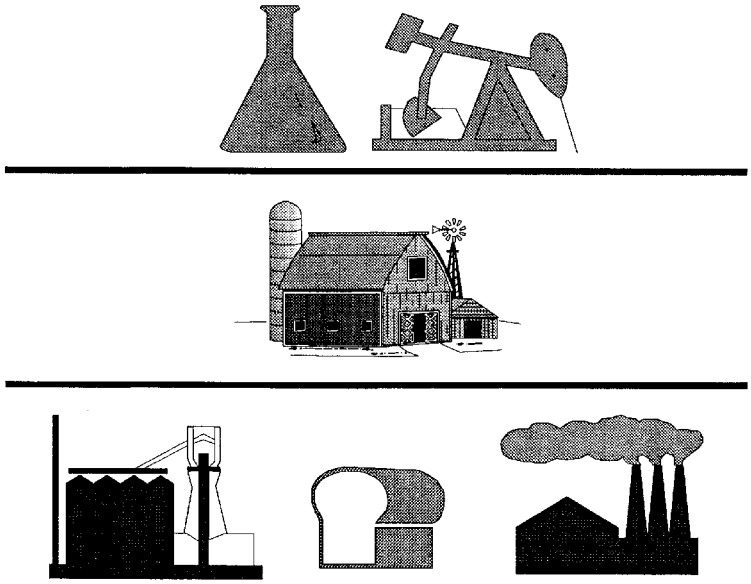

Figure 1

Market Economies and Creative Destruction

The preceding two definitions are heavily rooted in economic concepts and theories regarding the development of production and marketing systems to serve consumers. Implicitly, at least, the concept of consumer sovereignty within a market economy is the cornerstone for these definitions. Before proceeding to examine some specific drivers for change, we need to consider some essential principals that undergird the evolution of market economies.

In the 1930s, two European economists developed theories of how economies worked and changed. One, John Maynard Keynes, focused on the macroeconomy. Based upon the notion of describing the natural forces that led the economy to equilibrium, Keynesian economics was particularly appropriate for examining the role of large institutions, especially the role of government policy in times of depression. Keynes' thinking served to underpin much of the economic thinking of the post-war period.

The second economist, an Austrian named Joseph Schumpeter, developed concepts that approached the economy from very different perspectives. Whereas the implicit norm in a Keynesian world is equilibrium, Schumpeterian economics takes disequilibrium as the norm. Here, the focus is on natural forces that cause change in the economy. It's intriguing that in the last decade, Schumpeter's work has reemerged as a force in economics.

This reemergence of interest really has its origins in the reality of the marketplace of the late 1980s and 1990s. In this business environment, managers (especially American managers) found that:

great performance today
- is likely to be only **OK** if repeated tomorrow but
- is likely to be **not good enough** if repeated the day after tomorrow.

Schumpeter's work explains the manager's treadmill through the concept of Creative Destruction, which he argues is the essential fact about capitalism. Further, Schumpeter asserts that

Capitalism is by nature a method of economic change...

coming from new consumer goods,
new methods of production,
new markets, and
new market systems

revolutionizing the economic structure from within,
incessantly destroying the old one,
incessantly creating a new one.

Schumpeter's powerful words don't just relate to agriculture and agricultural markets. Indeed, that is why they are so important for those of us interested in the industrialization of Heartland agriculture. These words stress that throughout market economies there will be incessant and continual pressure to industrialize — to improve production and distribution systems to better serve consumers.

Five Specific Drivers

The Creative Destruction perspective sets a stage within which specific driving forces impact upon agriculture and the other sectors of the economy. Now let's examine five specific forces that are distinctly affecting the industrialization of Heartland agriculture. These are listed in Figure 2 and each will be considered in the following remarks.

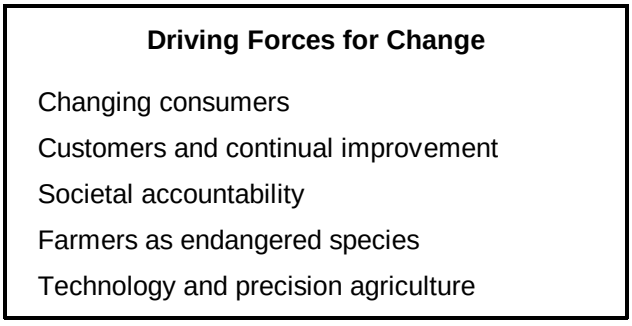

Figure 2

Changing consumers: Especially in the United States, consumers have learned to expect not just good, but continually improving, performance in the marketplace. Indeed, this is the ultimate expression of Creative Destruction. Consumers have come to expect both variety and excellence in the offerings they are provided in the market.

In developed economies especially, the marginal dollar for a food product competes not just with other food products but with all other potential uses of the consumer's dollar. A result is that providing large quantities of safe foodstuffs to meet average nutritional needs, although an important societal goal, is not effective in competing for additional consumer dollars. Instead, the ability to segment markets, including segments based upon attributes created on the farm, is emerging as a means to compete for agriculture's share of the consumer dollar (Sonka).

Customers and continual improvement: For most agricultural products, intermediaries, "the evil middleman," stand between the producer and the final consumer. In reality, these food processors and manufacturers are the farmer's customers, and their customers are food service providers and retailers. As suppliers, food processors have learned that defining quality in terms of customer needs and striving to continually improve are essential to survive and succeed. As customers, food processing firms (1) are developing similar expectations for their suppliers and (2) are increasingly viewing agricultural producers as suppliers (Sonka). Effective customer/supplier relationships have very different characteristics than do adverbial, open market commodity transactions.

Societal accountability: It is clear that society has become concerned with the practices and procedures employed in producing its foodstuffs. Specific examples relating to the environment, food safety, and labor practices are readily available. Whereas a commodity market operates with information about price and physically measured quality attributes, responding to societal concerns often means that additional information attributes (about the how, where, and when of production) need to be incorporated into the market. As these pressures increase, the commodity market becomes less effective in responding to consumer needs.

Farmers as an endangered species: Any casual reading of demographic data for farm operators in Heartland will tell a powerful story. The average age of farmers is increasing, the proportion of younger farmers is decreasing, and the proportion of agricultural production being conducted by farmers at or exceeding typical retirement ages is increasing.

Although not supported by any empirical evidence, it appears to me that the attitudes and expectations of those young people most likely to pursue livelihoods in agricultural production have changed in the last 10 years. Possibly because of the negative experiences associated with the farm financial stress of the 1980s, there seems to be more interest in pursuing a career in production agriculture and less enthusiasm for becoming an "independent family farmer."

These two trends suggest that attracting future management and labor to agriculture may require a differing production structure than that which Heartland agriculture has grown accustomed to.

Technology and precision agriculture: Anyone who has paid any attention to the farm media over the last two years couldn't help but be introduced into the information age and its potential impact on Heartland agriculture. There are two key elements here:

- Global positioning and its associated technologies allow us to consistently and repeatedly identify locations within the farm factory. This means that information collection, production processes, and decision making can be done with considerably more geographic precision.

- The Internet and associated electronic communication technologies promise to change the flow of communications within the agricultural production and distribution system. Relative to farm inputs, dialogue between farmers and their suppliers can start to replace mass communication and advertising. On the farm output side, information flows regarding consumer needs can now extend to the farm production level.

It's important to note the direction associated with each driving force listed in Figure 2. Only technology is a pull factor with the first four forces noted as pushing the sector to industrialization. This suggests that, with or without advances in information technology, the agricultural sector would be feeling pressures to industrialize. Precision agriculture and information technology facilitate, but do not directly cause, movements in that direction.

The Strengths of Commodity Agriculture Versus Creative Destruction

In a popular marketing strategy book of the 1980s, Ries and Trout stipulated that one of the keys to successful marketing was to attack the weakness inherent in the market leader's strength. In Heartland agriculture, commodity agriculture is the market leader; and, in the sense of Competitive Destruction, industrialization is attacking the weakness of commodity agriculture's strength.

Figure 3 lists five features of commodity agriculture. The first of these is that commodity agriculture in the Heartland is very successful in doing what it was designed to do — producing and delivering large quantities of undifferentiated output at relatively low cost. We who are involved in Heartland commodity agriculture should, from a societal perspective, be proud of and celebrate that success. But if we believe in Creative Destruction, we should expect that success to inherently lead to change.

The marvel of Heartland commodity agriculture is linked to its efficiency in coordinating a massive, geographically dispersed system at low cost. To accomplish this, the commodity system relies on the features of anonymous transactions, relatively coarse quality standards, and a focus on price and quantity information. These features are strengths in achieving the goals of a commodity system.

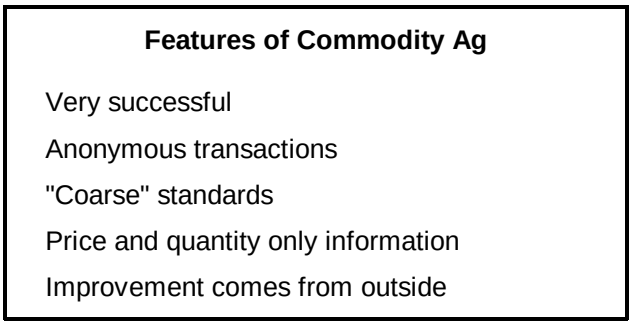

Figure 3

These same feature are weaknesses, however, in attempting to respond to the driving forces. Attempting

- to more effectively serve niche final consumer needs,
- to develop tighter supplier/customer linkages, and
- to establish information systems to accommodate societal concerns

all run counter to the inherent strengths of commodity agriculture.

The final feature of Heartland agriculture noted in Figure 3 is that improvement tended to come from outside the system, especially outside the farm firm. Because of historically high cost of data systems within production agriculture, improvements tended to occur in the form of technological improvements emanating from outside the farm firm. Although historically successful, we know from other industries that this approach can be significantly enhanced if decision makers can learn from the data created within their own production operations.

Precision agriculture offers that capability. However, precision agriculture can be most effective in creating improvement only when production information is linked with data on performance of the farm output within the customer's operations. Inherently exploiting these improvements requires movement away from a commodity approach and toward industrialization.

Is Industrialization of Heartland Agriculture Inevitable?

The preceding remarks attempt to set the stage for discussion of the implications of industrialization for Heartland agriculture. Both in considering the natural evolution of market economies and the definitions of industrialization, we see that industrialization is rooted in an inherent tendency to better serve consumers. We've reviewed driving forces that are shoving and tugging Heartland agriculture toward industrialization. Also, we've observed that efforts to address these driving forces within a commodity market framework are challenged because doing so in effect violates the strengths of the commodity system.

To conclude these remarks, I want to address the question I raised in the paper's introduction — Is the industrialization of Heartland agriculture inevitable? The Schumpeterian

view of Creative Destruction helps us to answer that question and also should allow us to better frame our discussion of the implications of industrialization in Heartland agriculture.

> If we adopt the notion that capitalism is by nature a method of economic change, we should see that the issue is **NOT** the inevitability of industrialization in Heartland agriculture. The real issue is the inevitability of **consumer choice**.

Remembering that industrialization is driven by the market system's goal to better serve consumers, one implication is clear. The economic health and vitality of Heartland agriculture will suffer if industrialization does not occur. One of the purposes of a market economy is to relentlessly punish those economic entities that don't continue to better serve their customers and final consumers. Therefore, as we consider the implications of industrialization of Heartland agriculture, let's remember that NOT industrializing has significant implications as well.

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Forces Driving Industrialization
Discussion and Comment

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Professor Sonka raises many provocative issues concerning the industrialization of Heartland agriculture in his paper. Although titled "forces," the paper actually devotes somewhat more attention to the outlook for industrialization. He uses Schumpeter's notion of "creative destruction" to argue that industrialization of agriculture appears inevitable in the Heartland, a steady progression to better meet the consumer's food demands.

While I agree that there is a certain inevitability to industrialization, it is less clear to me that commodity production will completely disappear in the nation's midsection. Moreover, there is a real question whether traditional commodity producers can re-invent themselves into a "pseudo-industrialized" structural arrangement that can compete with the costs and quality of the market-leading big players. Illustrated by the current attention to "networks" in the hog industry, whether commodity producers can successfully re-invent themselves may be one of the major themes of this conference.

In my comments today, I want to first add to the discussion of forces that are driving this fundamental remaking of agriculture in the Heartland. Then I will offer a few brief comments on the inevitability of this revolution. I conclude that while industrialization will become much more prevalent in the Heartland and will account for more and more of high value production, commodity agriculture will remain the basic backdrop of Heartland agriculture.

Forces For Change

Sonka lists five forces that are encouraging industrialization: changing consumers, customers and continual improvement, societal accountability, farmers as an endangered species, and technology and precision agriculture. As an aside, farmers as an endangered species seem less like a "force" to me than an outcome. So I tended to put somewhat more emphasis on the other four.

In simplest terms, the move to industrialization might be thought of as the result of three forces: a new consumer, a new producer, and a new way to manage risk. While these three overlap much of Sonka's discussion, they do suggest a few additional points.

The changing consumer. Sonka is right in putting the changing consumer first in his list of forces and for putting the consumer in the driver's seat in Schumpeter's treadmill of creative destruction. To a very considerable extent, industrialization is about converting agriculture from a mentality of "here's what we produce" to "here's what the consumer wants." This has coincided with the splintering of the food market into a myriad niches that correspond with the nation's growing diversity of tastes and preferences. Though some in agriculture have always worshiped at

the throne of the consumer, many have not. Today, the systems, information, and technology are available to hit a very small consumer target. Once consumers taste this new order, they are quick to leave broadly graded products.

Though it may be a small point and one that will not change the outcome, it may still be worth drawing a distinction between changing consumers and changing a set of choices for consumers. We tend to think that consumers are somehow becoming more finicky food buyers. My guess is that they have always been finicky. What has changed is that food retailers now have the information systems — including scanning — that enable them to identify both the market niches and the product characteristics to fill that niche. Moreover, the production systems are in place to provide a tailored, niche product at low cost. Thus, the essential difference in the food market of today may be that retailers can accommodate finicky buyers with ease instead of difficulty. Either way, the outcome is the same for agricultural producers — hit the new, smaller consumer target or be pushed toward even thinner profit margins in the commodity market. Put simply, the consumer is still in the driver's seat, but he simply has more seats to choose from — including the one he really wants.

Looking ahead, the power of scanning technology could give retailers more influence over food production than they have now. Scanning information may be the most potent weapon in targeting products for consumer palates and pocketbooks. Many retailers now have extensive information about which products are selling and to whom. Such information permits food companies to fine tune product formulations, packaging, and marketing strategies with much greater precision than before.

A new producer. Sonka provides a useful discussion of precision farming and the technology that both facilitates and demands new relationships in production agriculture. The key here is the word "precision." Science is enabling producers to fine tune agricultural products. Precision is a paramount demand of the new consumer, and biotechnology and precision farming are two ways that such precision can be incorporated from the earliest production stages — indeed, from the very selection of production inputs.

New technology will encourage industrialization in three ways. First, industrialization appears to be a better way to coordinate production decisions with the new technology to hit the right consumer target. Commodity markets are a broad road to the consumer, while industrialization provides a much narrower path. Second, the new technology is more proprietary, which encourages an industrialized structure to capture the dividends. The technology that enabled commodity agriculture was largely in the public domain — hybrid seed corn, for example. By contrast, a lot of the new technology is controlled by private firms — the new generation of hog genetics, for instance. Having sunk large amounts of capital into research and development, it is not surprising that these firms want to control production and revenues. Industrialization offers a cleaner way to do that. And third, industrialization appears to bring with it even bigger economies of scale than older production systems.

A new way to manage risk. Agriculture has two dominant characteristics that both are encouraging industrialization — it is capital intensive, and it is risky. The first fact has produced a long-standing trend to bigger firms that can handle the capital necessary to exploit the economies

of scale of new technology. This is evident in production, handling, processing, wholesaling, and retailing. In the case of production, the capital structure has generally been such that individual family operations could provide enough capital to exhaust most of the economies of scale. That appears to be changing. The risk in agriculture has encouraged decades of public intervention and the development of market mechanisms — including futures and options markets — to hedge those risks.

With the public less willing to underwrite risk in U.S. agriculture and with U.S. food companies growing even more capital intensive, industrialization offers an attractive way for both producers and food companies to hedge their risks effectively while still satisfying consumers. The large firms that control a substantial portion of the U.S. food system are capital intense and thus must be adept at managing their risks. Staring at the consumer with one eye and at Wall Street with the other, these firms see industrialization as an effective way to manage risks that are greater and more complex. Industrialization can reduce many types of risks. It reduces supply risk by assuring a steady flow of food inputs. It reduces quality risk by guaranteeing consistent, trait-specific products. It reduces financial risk by reducing the variability in input prices.

What Lies Ahead?

In light of the type and tempo of change seen recently, what is the outlook for industrialization in the decade ahead? Let me make four observations.

First, the tempo of change probably will quicken. The period ahead will almost certainly bring wholesale change in the hog industry. And while hogs may not be a good barometer for all other industry segments, the onward crush of new technology will encourage more product engineering from the farm to the consumer. A spate of farm rollovers to a new generation of operators may hasten the tempo.

Second, livestock segments will continue to move toward industrialization before grains. Poultry is there now, pork is moving there rapidly, and cattle feeding is probably next. Ranching probably never will be industrialized, simply because there are too many people for whom ranching is mostly a way of life and for whom market incentives are not decisive in business decisions.

But grains will move toward industrialization, even if slowly, mostly due to two complementary forces. A likely cut in government support for traditional commodity programs will make "government contracts" less attractive. While only a small percentage of the nation's major grain crops are produced under contract to private firms, the vast majority are grown under contract. It just happens that the contractor is the federal government and commodity programs are the marketing vehicle. Moreover, geneticists seem likely to unlock more special-use grains — a development that would almost certainly encourage identity-preserved contracts.

Third, the nation will increasingly have two agricultures. Even though industrialization is increasing at a faster rate, it does not follow that commodity agriculture is over and done with. It will certainly continue for some time. Many parts of the United States are highly efficient at producing commodities, and there will be a market for such products both here and abroad. For

some food products, industrialization may occur closer to the processing-retailing segments of the food system.

In short, one can think of commodity agriculture as the "sea" that covers most of the farm belt. But emerging out of this sea will be an ever-increasing number of islands of specialized production outside traditional markets. Some of the islands will be big, such as the pork industry, while others will be small, such as white corn for corn chips. The big difference between these two agricultures will be profit margins. Commodity agriculture will be low margin, and producers and processors will operate at low cost and high volume. The islands of specialized production will be more profitable, because more value is added. The question will be how the profits are divided between producers and integrators.

Finally, one of the biggest open questions will be whether independent producers can re-invent themselves. In the end, this is an empirical question, but let me offer a few general comments. Conceptually, one can think of a "network" of independent producers that might duplicate the product quality, cost, and efficiency of a big player who coordinates production with a collection of producers. The network would essentially be a cooperative. Cooperatives have been an important part of Heartland commodity agriculture. But will they work as well when the end product is highly specific, the production system is more demanding, and more capital is needed? To succeed, if they can, farmer/owners will have to be ready to relinquish production control to a greater degree than in the past. And cooperatives will have to improve their access to equity capital, historically a real challenge for them.

Conclusions

Industrialization is a watershed issue for Heartland agriculture. It is coming and coming quickly in some areas that have long been the bastion of Midwest farming. The forces producing the change are fundamental: consumers are demanding greater variety, and new technology is enabling food products to be engineered from the farm to the dinner table. As the U.S. government underwrites less risk, industrialization will be a more appealing way to manage risk in a capital-intensive industry.

Is this trend to industrialization inevitable? In some segments, such as livestock, the answer is probably yes. In other segments, a sea of commodity agriculture appears likely to remain spread across the Midwest. In either case, agricultural producers appear to be entering a period that will challenge their production systems and management decisions as never before.

Chapter 3

Industrialization of Agriculture: What Are the Consequences?

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Introduction

The agricultural sector, particularly the livestock industries, are in a period of major change and transition. This transition is commonly referred to as the industrialization of agriculture. Since Tom Urban popularized this term in an often-cited article in *Choices,* many have asked what it really means. Cynics have argued that it is simply the rediscovery of the concepts of Adam Smith as developed in *The Wealth of Nations* and the broader application of these concepts in agriculture. Others have suggested that creative businessmen and entrepreneurs who have historically focused on technology and other "more sophisticated" industries chose to apply some of the well-accepted industrial practices of process control, system analysis, routinization, strategic alliances, and quality control to agriculture instead.

Some academics have argued that agriculture is just recognizing the concepts of transaction cost, principal/agent theory, strategic management, negotiation/power, information, and performance incentives as expressed by Porter, Coase, North, Harrigan, Mahoney, and Williamson. Critics have suggested that agriculture and farming are being forcibly transformed from an industry that has been primarily a way of life to one that is a business, from one that has valued independence to one that imposes dominance and dependence. What is this threatening, insignificant (or at best not new) or innovative and creative transition (depending upon your viewpoint) in agriculture, and what are the consequences of the industrialization process?

What is Industrialization?

Industrialization of agriculture defies definition (everyone has his own perspective of the elephant), but let us try to describe it. A short, simple description might be

> The application of modern industrial manufacturing, production, procurement, distribution and coordination concepts to the food and industrial product chain.

Nice try; but what are some of these concepts? Table 1 is an attempt to capture some of the concepts in the format of paradigm shifts from old concepts that have dominated traditional agriculture to new concepts that describe industrialized agriculture. Many of these concepts are not really new; the innovation is in their application to a new industry, not in their initial discovery.

Table 1. Paradigm Shifts in Agriculture

Old Concept	New Concept
Commodities	Specific attribute/differentiated raw materials
Staple products	Fashion/niche products/projects
Assets drive the business	Customer drives the business
Hard assets (land, machinery, buildings) are the prime source of strategic competitive advantage.	Soft assets (people, organization, plans) are the prime source of strategic competitive advantage
Blending of commodity product from multiple sources	Separation of identity preserved raw materials
Geographically concentrated production sites	Geographically dispersed/separated production sites
Owning Assets	Control of assets
Money/finance/assets are the prime source of power and control	Information is the prime source of power and control
Labor is a cost and equipment an investment	Labor is an investment and equipment a cost
Sell product and give away service	Sell service and give away product
Expanding and getting into the business (entry)	Contracting and getting out of the business (exiting)
Impersonal/open markets	Personal/negotiated/closed markets
Adversarial relationship with suppliers and purchasers	Partner with suppliers and purchasers
Impersonal sourcing and selling	Relationship sourcing and selling
Outsourcing (buying) from multiple sources	Single site sourcing
Insourcing (produce your own) inputs	Outsourcing (buy from someone else) inputs
Price premiums for specific attributes and volume purchases	Cost reductions for specific attributes and guaranteed markets
Market (price) risk	Relationship risk
Independence	Inter-dependence/systems
Stability	Change/chaos/flexibility
Agriculture is an art form	Agriculture is primarily science based
Technical skills critical to success	Human/personal/communication skills critical to success
Technological change and innovation	Institutional (ways of doing business) change and innovation
Core competencies	New/different/unique skills and capabilities
Diversified production	Specialized production
Tradition/remembering	New ideas/forgetting
Public/open information and research and development	Private/proprietary/closed information and research and development
Resource users and exploiters	Resource protectors
Produce goods and dispose of bad/byproducts	Produce goods and bad; utilize/recycle bad/by-products

What are the Consequences?

Many of the potential consequences of the industrialization of agriculture are suggested or implied in Table 1. The following discussion will develop some of these consequences in more detail under seven themes: a systems approach, a manufacturing mentality, separation and realignment, negotiated coordination, risk, power and control, and information.

A Systems Approach

Systems/Process Flow. The manufacturing mentality places increasing emphasis on the entire value chain from raw materials supplier to end-user. This system rather than stage or segment focus reduces the chances for suboptimization within a stage or sector and dead-weight losses because stages are not well-matched in terms of product flow, characteristics, quality, or other critical attributes. Dead-weight losses can be particularly large in biological production processes where variation in many attributes is naturally wide because of variation in genetic and other inputs as well as growing conditions. Thus, there is the potential for a very high payoff if manufacturing processes can be used to reduce the dead-weight losses in the system.

Systems Cost. Although cost control is critical in any production system, the manufacturing approach focused on end-user products recognizes total production and distribution systems cost as being more critical than the cost in each stage of the value chain. And as more resources are out-sourced, the cost structure of the business changes with a higher proportion of the cost being variable in nature and a lower proportion fixed. With this changing proportion of fixed and variable cost, each stage becomes more responsive to changing end-user demands and competitive pressures. Since in the short run, the costs that influence production adjustment decisions are variable costs, the smaller proportion that variable costs are of total costs, the more prices must decline before firm's reduce output. Consequently, firms with a high proportion of fixed costs are quite lethargic in adjusting to changes in market conditions. In essence, an industry in which more firms have a higher proportion of their total costs that are variable costs is more responsive to changing market conditions.

Input Packages vs. Mix-and-match Strategies. With the increasing capacity to control and understand the biological process through biotechnology and genetic engineering techniques, producers will be more capable of developing optimal input combinations that match chemical and biological attributes to obtain the optimum quality and characteristics of output. For example, crop genetics are being matched to pesticides for optimal pest control as exemplified by Synchrony STS — a seed/herbicide system. Livestock genetics are being matched to feed genetics to obtain the proper ration and nutrient content to produce the most desired lean and other attributes in the meat product. In this situation, the classic mix-and-match strategy of the past where producers could buy feed or chemicals from one firm and genetic material from a second may become increasingly difficult. In some cases, the producer will purchase pre-specified input packages that are optimized in terms of their biological and chemical characteristics; in other cases, the producer will be warned that certain nutritional and genetic inputs respond better when used together and their performance may be suboptimal if used in other combinations. But this matched inputs strategy has risks — the risk of reduced flexibility and ability to adjust if supplies of an input decrease and/or prices increase.

A Manufacturing Mentality

Manufacturing Food Products vs. Producing Commodities. The transition of agriculture from a commodity industry to one with differentiated products, especially when combined with a focus on the food consumer and a manufacturing approach to production, indicates a dramatic paradigm shift in the industry. The produce-and-then-sell mentality of the commodity business is being replaced by the strategy of first asking consumers what they want as attributes in their food products and then creating or manufacturing those attributes in the products. This may in fact require changes in how the raw material is produced and what it doesn't contain (i.e., chemical residues) as well as what it does contain. This manufacturing mentality has become more predominant and has the potential to be increasingly successful as we learn more about the biological production process and as we gain increased capacity to control and manipulate that process through genetics, nutrition, building and facility design, and health management programs.

Systemization and Routinization. One of the characteristics of the manufacturing process is systemization and routinization. With increased understanding and ability to control the biological production process, routinization becomes increasingly possible. Tasks become more programmable. Routinization generally fosters more efficient use of both facilities and personnel as well as less managerial oversight and overhead. Hourly work schedules that identify specific tasks to be done at specific times on specific days in the modern farrowing or finishing unit are examples of the systemization and routinization in modern livestock production. Precision crop farming is another example. In essence, agricultural production is becoming more of a science and less of an art.

Specialization. An additional manufacturing mentality concept now being utilized in modern production systems is that of specialization, not only with respect to business venture and focus, but also with respect to individual employee tasks or function. As a larger proportion of the swine, dairy, beef, and poultry output is being produced by larger scale, specialized units, within these units employees are becoming more specialized in their task or functions with some focusing only on breeding, some on feeding, some on health maintenance, and so on. This specialization of function of personnel as well as business focus of the firm again is increasingly feasible because of better understanding and control of the biological process.

Scheduling and Utilization. A further implication of the manufacturing paradigm in agricultural production is increased emphasis on facility utilization, flow scheduling, and process control. In the past, variability associated with the lagged dynamics of output response to current and expected prices and the biological production processes has made facility use and scheduling and process control difficult if not impossible. Many production units have in essence maintained excess plant capacity as one means of accommodating the uncertainty of the output of the biological production process. But again, as a result of increased ability to predict and control that process, facility use can be more accurately predicted and controlled, and process control concepts to improve efficiency and reduce cost are more applicable and useful than in the past.

Separation and Realignment

Separation of Production Stages. The old paradigm in production agriculture has been to combine various stages of production within one firm — for example, to combine in swine production the breeding, gestation, farrowing, nursery, growing, and finishing activities in one firm at one location and, furthermore, to integrate these activities with feed production and processing. The new paradigm is geographic and stage separation of many of these stages of production. The advantages of this separation are not only scale economies and specialization of both human and capital resources, but also disease control and improved herd health (in swine production in particular). A further dimension of this separation is in the ownership and operation of the resources.

More assets in production agriculture are being out-sourced — for example, 41 percent of the farmland today is owned by a non-operator compared to 22 percent in 1945 (Wunderlich). Separation of the various stages of production does not necessarily imply separate firms, although stage and geographic separation may facilitate separation of ownership as well. Geographic and stage separation, in turn, frequently implies larger scale and more specialized capital, labor, and management resources at each individual plant site or facility location. Implications of separation for flexibility are unclear — more specialization in resource use decreases flexibility, but participation in only one stage may increase the options for negotiating with other partners in other systems <u>if other systems are in the market</u>.

Partnering and Alliances. At the same time that geographic and stage separation is occurring, the stages are being relinked by various forms of alliances. The traditional approach to agricultural production has been that of an independent producer who purchases inputs and sells products through various market mechanisms to other independent businessmen. Increasingly, producers are partnering with other resource suppliers in various ways to expand volume with limited capital outlays. In livestock production, this phenomenon is occurring through contracting arrangements; a hog integrator may own the breeding, gestation, and farrowing facilities, but contract out the nursery and growing phases. In essence, the integrator is leveraging volume by investing his funds in only part of the total fixed assets needed to produce hogs (approximately one-half of the investment is in breeding, gestation, and farrowing with the remainder in the nursery and finishing units), while maintaining a high degree of control of the other phases through the ownership of the livestock and the specification of the growing conditions. The critical dimension of such partnering or alliances is that more resources and services are out-sourced if that is a less expensive technique for obtaining production inputs, and more linkages up the value chain to the end-user are used to capture value in additional stages of the chain.

Negotiated Coordination

Spot Markets. Production agriculture in the past has focused primarily on commodity products with coordination through impersonal spot markets. The increased specificity in raw material requirements combined with the potential for producing specific attributes in those raw materials is transforming part of the agricultural market to a differentiated product market rather than a commodity product market. The need for greater diversity, more exacting quality control,

and flow control will tax the ability of spot markets to coordinate production and processing effectively. Open spot markets increasingly encounter difficulty in conveying the full message concerning attributes (quantity, quality, timing, etc.) of a product and characteristics (including services) of a transaction. Where open markets fail to achieve the needed coordination, other options such as contracts, integration, or joint ventures will be used. Thus, relationships among input suppliers, producers, and processors are expected to become less impersonal and more personal.

Information Flows. Related to the difficulty of spot markets conveying the proper information is the speed of information flows and the rate of adoption with different coordination mechanisms. In general, negotiated coordination results in more rapid transmission of information among the various economic stages and, consequently, enhances the ability of the system to adjust to changing consumer demands, economic conditions, or technological improvements. The ability of the production and distribution system to be more responsive and adjust rapidly to changing conditions is increasingly important with the increased rate of change in economic and social systems worldwide.

This ability to respond quickly to changes in the economic climate is critical to maintaining profit margins as well as extracting innovator's profits. Likewise, quickly recognizing erroneous decisions and making appropriate adjustments and corrections are essential to survival and success. Market coordination of systems characterized by biological lags cannot respond to changing conditions as quickly as an integrated or contract coordinated system. That is, the response at one stage can be initiated only after a full production cycle. By their nature, negotiated coordination systems require more frequent and direct communication between the decision makers at each stage on a wider variety of product and service characteristics than is typically possible with more traditional spot markets. Thus, the improved information flows and more rapid adoption and adjustment allow negotiated coordination systems to function more effectively in rapidly changing markets.

These arguments suggest that in traditional commodity markets where specific attributes are not demanded, supplies are fully adequate and can be obtained from various sources, and information flows between the various stages in minimal, traditional spot commodity markets can function quite effectively and efficiently. As one deviates from these conditions — which is increasingly the case with more specificity in raw materials, information flows, and fewer potential sources of acceptable supplies — various forms of negotiated coordination systems become more effective and necessary for efficient functioning of the production and distribution system.

Risk

Sources and Strategies. Risk has been a hallmark of the agricultural sector, and the industrialization of agriculture is both a result of, and has implications for, the business strategies that will be used to reduce risk. One risk is that of prices of inputs or products. A common business strategy is to reduce the risk of high prices for inputs by contracting for supplies. A related strategy is to reduce the price risk exposure on products by contracting product sales. Some firms reduce price risks by vertically integrating into the input supply or product

distribution channels. These coordination methods attempt to reduce the impact of market fluctuations that are part of the open market spot pricing system.

A second source of risk is related to quantity and/or quality features. Food packaging and processing unit costs have become very sensitive to operating at full plant capacity; thus, flow scheduling is critical to being cost competitive. Matching the physical capacity of various stages (for example, hog finishing capacity with packing plant kill capacity or turkey grower space with processor dressing capacity) is critical to overall efficiency of the system. This coordination may be more difficult to attain in open markets. Furthermore, some food distribution channels may require particular quality characteristics which may not be available in predictable quantities in open, spot markets. The coordination needed to ensure both quality and quantity for efficient operations can be achieved through contracts, ownership of more than one stage, joint ventures, or similar arrangements in the food production and distribution chain.

A third source or type of risk in the food chain that has become more serious in recent years is that of the safety and health risk in food production. This risk has two dimensions: the health risk of food-borne disease and the risk of polluting water, air, and land resources in the food production processes. These risks can result in significant direct costs and liability exposure for not only the responsible firm in the food chain, but also for the firms that supply related inputs and purchase products from the "responsible" firm in the case of strict (joint and severable) environmental liability related to chemical use. Thus, system coordination to reduce or control these risks may be in part a response to the broad sweep of product and environmental liability law.

Relationship Risk. The expanding use of contractual and other forms of negotiation-based linkages among the various stages within the agricultural production and distribution system and the decline in impersonal market-based transactions will result in price risk being replaced by relationship or contractual risk for many agribusiness firms. At a minimum, the shift from impersonal open markets to negotiation-based closed markets will impact who uses the risk allocation system offered by the futures and commodities exchanges and maybe even the product that is traded in those exchanges. Alternatively, it may change the volume of activity to make exchange less efficient and effective in risk allocation. This shift may eliminate the usefulness of exchanges completely, as is the case in fruit, vegetable, and poultry production.

Niche Markets. The food and industrial use markets for agricultural commodities are increasingly characterized as segmented or niche markets that can appear and disappear rapidly. This phenomena of market volatility (i.e., markets developing and then disappearing literally in weeks or months) does not characterize the generic commodity markets. For many agribusiness firms that are in the food processing and distribution business, the risk of changing consumer preferences or a food safety scare may be a much more critical and important risk to manage than price or availability of raw materials. One reason for a contractual arrangement to source raw materials is to reduce price and availability risk as well as food safety risk from chemicals and simultaneously to obtain the attributes needed in the final product from the specific attribute raw material. This technique for strategically managing multiple risk exposures is likely to become increasingly important in the industrialized agriculture of the future at the expense of using futures exchanges to manage the single dimension of price risk exposure.

Power and Control

Position Power. Negotiated coordination will replace impersonal open markets in much of the industrialized segment of agriculture. A fundamental issue in any negotiation-based coordinated system is the point (or points) and source of power or control. Who dictates or has the most control over the performance of the system, of sharing risk and rewards? Who has the power to resist or encourage change, to influence the acceptance and rate of adoption of new technologies and ways of doing business? And what is the source of that power or control?

Traditionally, discussions of power or control in an economic system have focused on issues of size and the ability to exercise monopoly or monoposy power as a function of volume or size — in essence, market dominance. With the increasing importance of the role of information in economic decision making combined with more negotiated coordination systems, the potential of economic power associated with a particular stage in the production and distribution process has surfaced. In essence, the question is whether there is economic power or control associated with a particular stage in the production and distribution system — is there position power as well as size power!

Points of Control. The basic argument is that there are two fundamental points of control and one fundamental source of power in a negotiation-based coordinated agricultural production and distribution system. The first point of control is the end-user or consumer and those firms that have intimate contact with the consumer. Consumers are more discriminating in their food purchases, want a broader spectrum of attributes in their food products, and increasingly have the purchasing power to convert wants into effective demand. It is not news that the consumer is the ultimate determinant of the attributes that food products must contain. And industrial product end-users will similarly demand the attributes they require. Those firms that are close to the end-user and understand the increased specificity of his/her demands have a unique capacity to communicate and/or dictate those demands to the rest of the production and distribution chain. This knowledge of consumer wants, needs, and purchasing capacity is a source of power and provides one point of control in the agricultural production and distribution system.

The second point of control in the agricultural production and distribution system is the raw material suppliers. But not all raw material suppliers have the same degree of power and control. In essence, the relative control of raw material suppliers depends upon the degree of substitutability for their input or contribution to the production and distribution process. Labor is substitutable for capital (although imperfectly); fertilizer is substitutable for land and vice versa. Machines can substitute (again imperfectly) for chemicals and labor for money. The one input with the fewest substitutes — that is, in essence, the most essential in the agricultural production and distribution chain — is the genetic material in plant and animal production, the seed and breeding stock. Biotechnology and increased predictability and control of genetic manipulation provide additional power to those who control genetic material. Thus, the second point of control in the agricultural production and distribution system is the owner of the genetics.

Knowledge and Information. Note that the points of control in the agricultural production and distribution chain are at the beginning and the end — the genetics and the end-user/consumer. The source of this control is knowledge in both cases. At the consumption end, it is knowledge of

the ultimate end-users' wants and needs which can be communicated through the chain. At the opposite end, it is knowledge and information about and the ability to manipulate the genetic material that will produce the specific attributes for which end-users are willing to pay. By the very nature of their business, retailers or food processors and genetics companies have better access to information at these points of control. Given that the source of control is knowledge and information (not physical resources, not capital, not land), then the only way a firm between the end points of the end-user and the genetics company can obtain control is through superior information. The implication is that it is very difficult for those in the intermediate stages, including producers and processors, to obtain superior information and, thus, the power base for control of the system.

At this early stage in the process of shifting from impersonal markets to contract or ownership coordination, there may be a first-mover advantage for very large producers or producers' cooperatives to play the control role. Thus, initiative now by the intermediate firm level may offset the perceived advantage of firms at the end points. Coordination by producers' cooperatives has the potential for the more traditional producers to retain a more prominent role. But unless such firms make preemptive moves early in the transformation from open markets to closed systems, the opportunity for control will likely be lost.

Presently, food systems coordination is accomplished primarily by processors when not by open markets. Recent indications of weakening brand loyalty have been attributed to a lessening of real product differences and a consequent emphasis on price (*The Economist*). This shift positions the retailer for a larger role in non-market coordination. Fast food restaurant firms already exercise extensive system coordination and control for their major supplies, reflecting consumer preferences. Diminished brand loyalties may diminish the power of processors to extract extraordinary profits. However, the processor is likely to continue to play an important role even as power shifts to genetics firms and toward the end-user.

The Role of Information

An Increasing Role. Although numerous forces and drivers are contributing to the structural changes that are occurring in agriculture, information and knowledge play a significant role. As in other industries characterized by negotiated or personal linkages, those individuals with unique and accurate information and knowledge have increasing power and control in the agricultural production system. And with power and control is the capacity to garner profits from and transfer risk to others with less power as well as to influence the rate of technological and institutional change in the industry.

The increasing role that knowledge and information play in obtaining control, increasing profits, and transferring risk in the agricultural sector is occurring for two fundamental reasons. First, manufacturing food and industrial products has become an increasingly sophisticated and complex business in contrast to producing commodities in the past. This increased complexity means that those with more knowledge and information about the detailed processes as well as how to combine those processes in a total system (i.e., the value chain approach) will have a comparative advantage. The second development is the dramatic growth in knowledge of the chemical, biological, and physical processes involved in agricultural production. This vast

expansion in knowledge and understanding means that those who can sort through that knowledge and put it to work in a practical context have a further comparative advantage. Thus, the role of knowledge and information in achieving success in the agricultural industry is more important today than ever before.

Access to Information. The logical question then for individuals in the food and industrial product manufacturing chain is how to obtain access to this knowledge and information. Historically, particularly for the independent producers in the farm sector, this knowledge and information has been obtained from public sources as well as from external sources such as genetics and chemical companies, feed companies, machinery and equipment manufacturers, packers and processors, etc. In general, independent producers have obtained knowledge and information from external sources in much the same fashion as they have sourced physical and financial resources and inputs. In contrast, ownership or contract coordinated production and distribution systems have sourced their knowledge and information from a combination of internal and external sources. Many of these firms or alliances of firms have internal research and development staffs to enhance their knowledge and information base. And the knowledge they obtain is obviously proprietary and not shared outside the firm or alliance. It is a source of strategic competitive advantage.

Integrated Systems. The research and development activities in coordinated systems are more focused on total system efficiency and effectiveness rather than on only individual components of that system. They are focused on integrating the nutrition, genetics, building and equipment design, health and disease control programs, marketing strategy, etc. rather than on these areas or topics separately. And in addition to more effective research and development, such alliances or integrated firms have the capacity to implement technological breakthroughs more rapidly over a larger volume of output to obtain larger innovator's profits. In the case of a defective new technology, ownership/contract coordinated systems generally have more monitoring and control procedures in place and can consequently detect deteriorating performance earlier and make adjustments more quickly than a system with impersonal market coordination.

As knowledge and information become a more important source of strategic competitive advantage, those who have access to it will be more successful than those who do not have access. Given the declining public sector funding for research and development and knowledge and information dissemination which has been the major source of information for independent producers, the expanded capacity of integrated systems to generate proprietary knowledge and technology and adapt it rapidly enables the participants in that system to more regularly capture and create innovator's profits while simultaneously increasing control and reducing risk. This provides a formidable advantage to the ownership/contract coordinated production system compared to the system of independent stages and decision making.

Value of Information. With the increased context specificity and decision-focused nature of information in recent years, it has become more valuable. And as information becomes more valuable, the incentive for the private sector to provide that information and capture some of that value increases. Consequently, growth in the private sector data gathering and information service firms is not surprising, given the growing value of information.

Because of the increased value of information and the expanding role of the private sector in providing it, the issue of the proprietary nature of and access to data and information becomes more important. With the increasing value of information and its use as a strategic competitive advantage, there is less free exchange of data and information. And the issue of who owns the data and information becomes critical. For example, with respect to site-specific soil characteristic information, who owns it — the grower who paid for it or the service company that gathered it? Can a grower obtain this information from one company such as a fertilizer or chemical dealer and then provide it to a competitor who might have a lower price on fertilizer or chemical products? Does it make a difference if the grower pays for the service and how much he pays or if the information service is provided as part of a bundled package with the product? If coordinated production systems have the potential to obtain superior information, how can a producer who is not part of that system obtain access to similar information to remain competitive? Will you need to become part of the system — "in the loop" — to obtain access to the latest information to be competitive?

Public Policy. In a broader context, the public policy issue of intellectual property rights and the role of the public sector in making information a public good that is broadly available to all potential users becomes critical. The intellectual property rights debate has historically focused more on research and development and new innovations protectable under patent or copyright law. Particularly in agriculture, the public sector has played a major role in the research and development activity and, thus, has provided broad access to new technology and ideas. In this context, part of the public purpose was to develop and disseminate new ideas in a sufficiently broad fashion so that a wide spectrum of users benefited and so that individual firms could not restrict access and capture the value associated with the new idea. The public sector role was that of leveling the playing field so that all participants competed on the same grounds vis-a-vis access to new ideas and information.

But as more and more of the research and development and, thus, new ideas come from private sector firms rather than from the public sector and more of the information dissemination system becomes privatized, individual firms have more potential to capture value at the expense of end-users. They have the potential to restrict access to new ideas and information to particular users, thus favoring some producers and excluding others from the ideas, technology, or information necessary for them to be competitive. The concepts of intellectual property rights, including patent and copyright law as applied to agriculture, were developed in an era of domestic markets and national firms; a relatively large public sector research, development, and information dissemination system; and a limited role of information as a critical resource. These concepts should be reevaluated in the current context of global markets and multi-national business firms, the shrinking role of the public sector in research and development and disseminating information, and the increasing importance of information compared to other resources as a source of strategic competitive advantage.

A Final Comment

Significant changes are occurring in the agricultural production and distribution sector; these changes will dramatically impact the management of production and distribution firms from sourcing of inputs through operations, finance, and marketing to end-users. Most significantly,

these changes have profound implications for the skills and knowledge needed to be successful in the future. Without a doubt, technical knowledge and skills will be essential with the growing sophistication of the production process as well as the variety and demands of end-use markets. But technical skills and knowledge are not expected to be the core source of strategic competitive advantage. The skills needed to be successful in the future are more likely the human and personal skills: negotiation ability, creativity and innovation, vision and strategic thinking, evaluation and acceptance of new technologies and institutional arrangements, and recognition of segments, niches and diversity. These critical skills are more difficult to develop, but those who do so are expected to have a sustainable strategic competitive advantage in the changing world of agriculture.

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Reaction to Michael Boehlje
"Industrialization of Agriculture: What Are the Consequences?"

The Honorable Sarah Vogel, Commissioner of Agriculture
State of North Dakota

I must confess that as the date of this presentation approached, I had greater and greater trepidation about reacting to a paper written by an eminent economist, in a room largely occupied by economists. I had four reasons for this trepidation: First, I fear that I am being typecast. Dr. Boehlje here is "for progress." As reactor, it appears that my role is to be "against progress." Second, Dr. Boehlje is a famous, outstanding economist; and I am not an economist. By so saying, I am not being humble. I am, in fact, a three-time dropout from "Econ 101" at the University of North Dakota.

The third reason for my trepidation was that when I first opened Dr. Boehlje's paper, my eyes fell upon this sentence on page four of the draft

“This system rather than stage or segment focus reduces the chances for suboptimization within a stage or sector and dead-weight losses because stages are not well-matched in terms of product flow, characteristics, quality, or other critical attributes.”

I was awestruck. That sentence was way over my head. I read it forward, backward, and every other line, then every other word. Still nothing. I was pretty depressed until I realized this must be a prime example of economist talk. Then I recollected that I am a lawyer, and a lawyer should not be intimidated by mere economist talk. Never! Any profession that comes out with legalese should never be intimidated by economist talk.

But I must point out that lawyers do recognize that we should write in plain English. The question of the hour — or two-day conference — is do economists recognize the need to write and speak in plain English? Despite all evidence to the contrary, I will assume they do and have accordingly provided a reference to a book on how to write in plain English. In addition, I shall omit all legalese double talk from my "reaction" remarks. (Applause, please.) And, in addition, I shall also omit all economic double-speak from my remarks. (Applause, please.) As you may have gathered, the latter omission is really rather easy.

My fourth reason for the trepidation was that I've tended to get into some rather wild arguments with economists over the years; and meeting with a whole roomful, all at once, is frightening. By the way, the reason for these arguments over the years is my thesis that all hard-working farmers should survive, especially if they are in temporary economic trouble due to economic trends created by misguided economists' misguided economic theories. I can't imagine why I get into arguments over such an obvious truth. Can you?

So, let me begin. First, I would like to use a few words conspicuous by their absence from Dr. Boehlje's paper: "farmer," "people," "men, women, children," "sunshine," "soil," "rural,"

"plant," "livestock," "family farmer," "environment," "ecosystem," "harvest," "neighbors," "home town," "home place," and "VALUES."

Moreover, when economic theories turn out to be wrong, the result is not the euphemistic "production unit" facing "adjustment." No indeed. Let me tell you from the perspective of a lawyer who has worked with a lot of these so-called "adjustments." It's words like "tears," "heartache," "loss," "bankruptcy," "shame," "isolation," "anger," "foreclosure," "repossession," "loss of dreams," "loss of self-worth," and, in some bad cases, "suicide" or "violence."

Not too long ago, I attended a commissioners of agriculture meeting at which the commissioners were wrestling with the thorny problem that "conventional agriculture" did not enjoy the same good reputation and good public image with the press and public as did "sustainable agriculture." The solution they arrived at was simple. Redefine "conventional agriculture" as "sustainable agriculture." Voila; all the criticisms of overuse of pesticides and fertilizers and exploitation of the environment would be washed away because, voila, all farming as we know it would be sustainable.

I am reminded of that definitional debate when I view Dr. Boehlje's paradigm chart. On the right side of the chart is a long list of new, mainly positive developments identified as industrialization. On the left side are the old, mainly outdated, mainly negative conditions identified as pre-industrial. I believe Dr. Boehlje's chart is less accurate than that definition of industrial agriculture provided by Marty Strange of the Center for Rural Affairs. Mr. Strange defined "industrial agriculture" as a system of agriculture which is

> Industrially organized
> Financed for growth
> Large scale, concentrated
> Specialized
> Management centered
> Capital intensive
> At an advantage in controlled markets
> Standardized in their production practices
> Resource consumptive
> Farmed as a business.
>
> (This description is excerpted from Marty Strange, Family Farming, 1988, pp. 36-39.)

When I compare Marty Strange's description to Dr. Boehlje's paradigm shift, I see a number of parallels, but also several incongruities. For example, the fifth listed "new concept" of geographically dispersed production sites coincides more with family style farming than "industrial agriculture" as we know it. Hogs in North Carolina, for example, are concentrated in only a few counties; whereas, ownership and placement of hogs in Iowa is dispersed widely throughout the state.

Another incongruous paradigm category says "fashion, niche products, and projects" are new "industrial" concepts; whereas, staple products are "old" concepts. This doesn't match. Most of the innovative farming I see in North Dakota is very grass roots, very personal, not industrial.

Another surprising item is that "resource protector" is identified as with the industrialization trend, not resource user and abuser. The reverse is a more common perception based on monoculture, intensive use of pesticides, concentrated wastes, etc.

To be viewed as a "resource protector" is extremely important to the industrial agriculture segment, because this is a broad-based value shared by society as a whole. If industrial agriculture believes it can gain credibility by associating with that value, it can do so by words, if not deeds. There is no "greener" advertising on TV than the pesticide advertisements. You would swear you were watching an ad for saving songbirds at first glance. A stark example is DuPont Chemical. DuPont is simultaneously the number one "green message" advertiser on television (do you remember their clapping seal ad?) and the number one emitter of toxic waste in the United States. It's ironic, but not inadvertent.

It is an interesting exercise to substitute the phrase "ecological agriculture" for "industrial agriculture" in the "new concept" column in Dr. Boehlje's paper. I believe "ecological" is a better match to the paradigm overall, yet I thoroughly doubt ecological agriculture was on Dr. Boehlje's mind when he developed the paradigm. The right-hand column does accurately represent many trends, but I am unsure if these trends are <u>because</u> <u>of</u> industrial agriculture or <u>in</u> <u>spite</u> <u>of</u> industrial agriculture.

In politics, there is an old joke that says a leader is someone who finds out where the people are going and runs out in front of them. I am afraid industrial agriculture is looking at where the people are going and trying to jump out ahead of them.

And now, let us move to the text of the remarks to which I am reacting.

Regarding the systems cost, I wish to point out several obvious drawbacks to a low fixed cost scenario in agriculture. In my state in 1993, farmers had, overall, $22.5 billion in farm assets, of which $15.4 billion was in land. In other words, 68% of all our farmers' assets was tied up in land. Does this high proportion of fixed assets make farmers "lethargic" in adjusting to changes, or does land ownership make farmers stable, reliable, long-term thinking, and future oriented?

If it is the case that "industrial agriculture" will lead to lower fixed (i.e., land) assets, then who will own the land? I believe it is widely acknowledged as true that individual home ownership, rather than home rental, leads to a stronger ethic regarding maintenance, improvements, and appearance of homes and neighborhoods. Why should one not question the intrinsic commitment and values of industrial agriculture if it actively seeks to be the "renter" and the "tenant" farmer? Is the absentee landowner more likely to plant or weed a shelterbelt, or is the resident owner? The answer is obvious.

On the bright side, there should be no further demands to repeal anti-corporate farming laws across the Midwest.

A greater shift to variable costs will make it easier for the producer to get in and out. It also suggests consumer vulnerability if key products are withdrawn.

The next section "Input Packages vs. Mix and Match Strategies (page 36)" starts with a statement I would like to challenge.

> With the increasing capacity to control and understand the biological process through biotechnology and genetic engineering techniques, producers will be more capable of developing optimal input combinations that match chemical and biological attributes to obtain the optimal quality and characteristics of output. (Emphasis added.)

Folks, our track record of "controlling" nature isn't very good. Our attempts at "control" frequently blow up in our faces. For example, let's look at the ability of insects and weeds to resist herbicides and insecticides after a few short years of use. Or we can ask ourselves if our national policy of draining wetlands was a good choice. We are often 180 degrees wrong in our expectations of what our "control" will achieve.

As Rachel Carson pointed out in her historic book *Silent Spring*, the inventor of DDT, Paul Muller of Switzerland, won the Nobel Prize. Despite these scientific accolades, DDT is deadly toxic and is now banned virtually everywhere in the world.

In 1962, Rachel Carson talked of DDT, Dieldrin, Toxaphene, Aldrin, and other chemicals as being extremely dangerous, not only to wildlife, but also to humans. She was condemned as an extremist and a hysteric. The chemical companies stoutly defended the safety of their products and attacked Ms. Carson and her book.

But she was right, and they were wrong.

DDT was not banned until 1973, and then only in the United States. We kept on exporting it through 1978.

The scary thing about *Silent Spring* is that in 1962, Rachel Carson described what has since become the target list of chemicals that North Dakota and many other states are trying to remove from farms and farmsteads. In North Dakota, we call it Project Safe Send. Over three years, our Project Safe Send grand total is 130 tons, and we are not done. We have paid, so far, $1,153,667. This cost was not internalized when the benefits of these chemicals were pitched to the farmers.

Some may say, "Well, this is all in the past." Is it really? When we try to control nature, it seems we cannot even figure out the right questions. For years, we have been studying the cancer-causing effects of chemicals. It didn't occur to us to ask about endocrine disruptions. I have an inch-thick stack of scientific papers on the effects of chemicals on the endocrine systems of wildlife and humans. Incidentally, these papers are not in plain English, but let me summarize by quoting the caption to an article in *Newsweek* last March.

> The Estrogen Complex. Sperm counts down? Penises shriveled? Hey, Rush, don't blame it on feminists. It may be from chemical pollutants in water and food.

Can't get much plainer English than that. I think it's fair to say that if "man" really "controlled" nature, shriveled penises would not be the result.

Let's move on, shall we.

I largely concur that the agriculture system is moving from a system of producing and then finding a buyer to a new system of finding out what the consumer wants and then producing that product. The mystery, however, is what the customers want.

The scheduling and utilization section is interesting because industrialization seems to have a goal of a "just-in-time" food supply. But do you remember the Biblical story of Joseph? Joseph was called up from the dungeon to interpret a dream of the Pharaoh. The dream involved seven fat and seven thin cattle and seven fat and seven thin ears of corn. Joseph said the dream meant there would be seven years of plenty, followed by seven years of famine. He advised the Pharaoh to set a fifth of the land aside in the seven good years to provide for the lean years. As the seven lean years came along, Egypt had food, and Egypt also sold food to all the surrounding lands. Now, that wasn't what we would view as "just-in-time" production, but by God, it worked.

In thanks for his dream interpretation, the Pharaoh made Joseph the food minister and the ruler over all of Egypt. Is this a pitch to have the Ag Commissioner a ruler over all of North Dakota? No. But I do want to make the pitch that food is different. The world can do quite easily without economists and without lawyers, but it can't do without food. And farmers raise that food.

"Just in time" in America is our next meal. A day without fresh milk or bread in the stores of Bismarck or Minneapolis would cause major chaos. Visualize thousands of mad mothers asking, "Where's the milk?" and then, the really dreaded question, "What politician is at fault?"

While the benefits of separation, coupled with alliances, are listed in the paper, several drawbacks bear mentioning. One of the losses caused by separation of stages is that direct management control and direct knowledge of the whole process is lost. If a particular producer's specialty is to take a pig from 40 to 220 pounds with purchased 40-pound pigs and purchased feed, he will have no direct knowledge of the feed nor of the past or future of the pigs. Does it matter? Lack of knowledge of the "whole" process, including consumer wants/needs may lead to the wrong (less than optimal) goods being produced. "Successful" development of the hard tomato, which could accommodate mechanical picking, but not consumer palates, is just one example.

A more recent example can be found in 1988 when we had a drought of near Biblical proportions. In 1988, the United States had "too many" bushels of corn in reserve, over 4 billion bushels. FAPRI asked: What would have happened to food prices had stocks been reduced to the "right" amount of 2.3 billion bushels? The answer is shocking. Huge sell-downs of livestock herds

would have occurred, the price of beef, dairy, and pork would have skyrocketed. Consumers would have paid $40 billion more for food between 1989 and 1996. Yes, the government would have saved $14.7 billion between 1986-1990. But the cost to society would have been $25.3 billion. [Source: Assessing the Effects of the 1988 Drought on U.S. Agriculture under Alternative Stock Scenarios, FAPRI, 1990.] I want to stress that this hypothesis was with reserves of 2.3 billion bushels. What would have happened with no reserves is frightening to contemplate.

Another example might be General Mills, which had a loss of $140 million and sent 50 million boxes of cereal to the landfill when oats were improperly fumigated by an independent contractor. In retrospect, it would have been less costly to have one in-house, properly trained employee do the fumigation.

A greater concern is that this type of separation creates extreme dependency on a few select suppliers and buyers. This dependence has the potential to be extremely risky for individuals whose entire cash flow depends on the decisions of the 40-pound pig supplier. In the section on systems cost, it is listed as an advantage of the "new" industrial system that a stage producer (i.e., birth to 40 pounds) can decide to quickly exit in response to a change in the market. For the farmer who has decided to be in the secondary stage from 40 to 220 pounds, the decision of the first supplier may be fatal. The only protection might be strict, enforceable, contractual protections that would probably have to end up with federal or state regulatory muscle and oversight, precisely what the voting public does not want.

Negotiated coordination. With respect to negotiated coordination, I am somewhat concerned that contracting might be confused with personal relationships. I still live in a state where a person's word is generally relied on, where credit, insurance, fuel, seed, and supplies more often than not come from a cooperative of which the farmer is a member and where his grain goes to a cooperative. But even if the buyer isn't a cooperative, I would ask this: Is a contract with Cargill more "personal" than selling your feeder cattle at an auction market owned by Joe Schmidt, who went to high school with your brother, Fred, and at which your cousin's wife is the bookkeeper? I think not.

Major risks are endemic to the new "industrial" contracting format. As Neil Hamilton has pointed out in his new book, *A Farmers Guide to Production Contracts*, a corporation is not a charity; and if greater rewards are promised by a contract, then these are offered in exchange for something else. Frequently, the contract is a device to shift risk, not share risk. You might also wish to refer to Randy Roth's recent law review article cited in the reference section.

A new kind of risk is limited information flows. In the past, public market information has assisted price discovery. As more production moves from public markets to private treaty (e.g., niche, identity preserved and premium contracted products), then the public markets will be less functional and ultimately irrelevant. For example, if a durum grower, who contracts for high quality durum, does not have premium durum one year due to weather variables and needs an alternative market, how is he to discover price for that lesser quality durum? It is possible that in the absence of public markets, price discovery problems will squeeze contracted suppliers out. As Dr. Boehlje pointed out, fruit, vegetable, and poultry production exchanges are irrelevant. Is this because they don't have fair markets for less than ideal quality production? Are non-contracted

suppliers squeezed out because they don't have first access to price premiums for high quality production? Is this the fate for grains as well?

Let me display a little provincialism. I believe wheat to be an extraordinarily important crop. It is the basis for the "staff of life." In the Lord's Prayer, Jesus asks for daily bread before he asks for forgiveness of sin. Are we willing to have "just enough" and "just in time" production and availability of wheat? Do we wish to live with the possibility of periodic bread, not daily bread?

Niche markets. Changing food preferences and consumer fears are fascinating to watch and study. For over 20 years, I have been hearing that this "health thing" is just a fad. It is not a fad. Now I will admit that our eating patterns may be somewhat hypocritical (OK, they are very hypocritical), but low fat, low cholesterol, additive free, and natural are the selling points. Even my son's package of Froot Loops (which is not designed as a health food cereal) advertises "all natural fruit flavors," "10 essential vitamins and minerals," and "low fat."

I believe that industrial agriculture's desire to address consumers' food safety is coming about in reaction to consumers' reaction to industrial agriculture. Industrial agriculture isn't being proactive; it is being reactive to consumer rejection.

At some point, we should step back and ask whether the trend toward industrialization is a good or bad idea.

Are consumers, the environment, our social fabric better off or worse off when all hogs are of a few genetic strains? What happens if there is a food scare on one of these strains? With our present system, there is far less likelihood of a widespread reaction to a food scare problem.

Power and control. Power and control. There's the big question. Who's got it? Who should have it? Who gives it up? Who keeps it?

One source of power and control identified by Dr. Boehlje is understanding the consumer. The "consumer," by the way, tends to be a working woman with children, with or without a spouse. Let me just ask you men in the audience a question. How many of you read the *Economist* or the *Wall Street Journal*? How many read *Prevention*, or *Parenting*, or *Good Housekeeping*, or the *Ladies Home Journal*? Well, let me tell you, the proportion is reversed in Dan's Supermarket in Bismarck, North Dakota, among the ladies in the line who are buying the week's groceries.

One of the difficulties that will arise with industrial agriculture's seeking to "control" (there's that word "control" again) or even "dictate" to consumers is that consumers tend not to trust persons who seek to control or dictate to them. I saw a food safety survey once where the disregard for the government experts was stratospheric. Consumers trust popular magazines far more than they trust FDA or USDA.

If the consumer, who is referred to by Dr. Boehlje as a point of "control" and a "source of power," is educated, informed, and knowledgeable, then consumers' choices will drive the market. However, the trend may in fact be to use public relations skills to manipulate, not educate, the

consumer. If so, there will probably be a demand for more government regulations and more mandated disclosures.

In my supermarket recently, the produce manager put up a sign which listed the fruits and vegetables that had wax applied as a preservative. Wax, as such, is fine, but the fine print said some of the waxes were petroleum based. Eating petroleum-based wax may be absolutely safe, but it sure is unappetizing. That day I didn't buy any of the waxed fruits and vegetables. On subsequent trips, I haven't seen that sign. But in any event, I am going less to the supermarket because the locally owned, organic vegetable market six miles out of town is now open and displaying pricey, but superlatively good, unwaxed vegetables.

Can you imagine the shift in consumption patterns if potatoes, honey, lettuce, and tomato growers had to list the chemical name of the sprays applied? And their LD-50 numbers?

As a politician, I've been told that ethical choices should be made by asking this question: Would I like to see this on the front page tomorrow? Perhaps industrial agriculture should ask itself the same question about the processes used. If not, regulations will follow sure as night follows day.

This trend to greater regulation and greater disclosure, I believe, will be in direct relationship to the degree to which consumers and citizens believe human beings, known as family farmers, produce the food or to which they believe corporations produce the food.

The big buzz now is about genetics. I am a state regulatory official; and I tell you, I am not comfortable with the fact there are 39 unregulated, separate, genetically altered organisms already released and under trial in my state. Maybe we have so many released because my state has no regulations? Maybe consumers and concerned citizens in North Dakota and other states will demand a "point of control" over information on these releases? If they want to know, that information will be obtained through regulation. Government isn't fully trusted, either; but in this circumstance, citizens will have no options other than to turn to government to get that information.

I think a very strong case can be made that one of the strongest demands for access to information will be by consumers. It isn't going to be a one-way stream of information about consumers to business to generate greater profits for businesses. Consumers will want, and probably get, more information about business.

I wholly concur that as knowledge and information become more important, those who have access to it will have more success. This is why I believe there will be a demand to return to greater, not less, publicly funded research and development. The decline of funding for public research can be reversed by a shift in public policy. Coupled with more regulation of seed laws, genetics, intellectual property, and tough anti-trust enforcement, the trends could again favor smaller scale, family based agriculture.

I, too, would like to offer a final comment. Where does the family farmer fit in? I believe we can be the architects of our own destinies. We can design a future where food production is controlled by a handful of conglomerates, or we can design a system where food is provided by a

vast network of family sized farmers. I know what future I would prefer. And I hope that every economist in this room will make it a mission to do what they can to ensure that there will be family farmers in the future of agriculture.

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Chapter 4

Consequences of Industrialization on Communities

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Introduction

A friend and colleague of mine, upon learning that I had agreed to write this paper, remarked, "My, what a foolish boy you are." At my age, I can easily discount the "boy" part of his comment; but after wading through many papers, articles, and books related to this topic for the past two months, I'm afraid I have little evidence to discredit his description that I may be "foolish," given the paucity of research on the topic which has a common and coherent conceptual framework. Nonetheless, a commitment made is a commitment to fulfill!

The topic of this paper, Consequences of Industrialization (of Agriculture) on (rural) Communities, raises many questions, among them:

1. What is industrialization of agriculture? When does adoption of new agricultural practices and technologies become industrialization? Is the terminology, **industrialization of agriculture,** an economic term? Is it a sociological term? Is it a pejorative term laden with ideology and values meant to suggest inevitable negative outcomes?

2. What is included in the term agriculture? Only farms? Farms and agribusinesses?

3. What is "rural" community? Is it every rural town, regardless of size, surrounded by farming? Is it a county with several towns? Is it a trade center? Is it a social system capable of collective action?

4. Is the romantic, nostalgic memory of a more bucolic time in rural areas dominated by agriculture really a desired state of being, or is it a convenient petard or myth for those whose real resistance is resistance to change, any change?

5. Why is the industrialization of agriculture any more or less destructive to the quality of life in rural communities than the changes brought about by new technologies in discount and franchise merchandising, communications, transportation, health services, and education?

6. How do the concepts of social justice, democracy, free enterprise, and individualism relate to this area of concern?

7. What options, if any, are available to communities to ameliorate the impacts of agricultural industrialization that negatively impact some or all of the citizens in the community?

My intent in this discussion is to review and comment on the relevant literature, make an effort to summarize the consequences of large-scale agriculture on today's communities, and, finally, to discuss the options that communities have for dealing with the issues of wide pubic concern, including industrialization of agriculture.

Industrialization of Agriculture

Though much has been said about the industrialization of agriculture, Urban (1995) indicates that "We are on the threshold of a significant shift to industrialization of the world's food system and concurrent shifts in food policy, farm policy, trade policy and rural development. Industrialization is ultimately a process by which consumer's wants and needs are fed back into a production and distribution system to improve desired quality, availability and price" (p. 8). Urban suggests that "this shift to industrialization could lead, in the developed world, to the emergence of a new family farm tied to a more stable system of production" (p. 8).

Industrialization of agriculture has been going on since the adoption of first practices that permitted farming to be conducted on the same site for an extended period of time rather than the historic slash, burn, wear out, and move on pattern of early agriculture. As Cornelia Flora noted in the Foreword of *Beyond the Amber Waves of Grain* (1995), "Throughout most of the post-World War II period, farming has undergone a dramatic shift from being organized in a dispersed system of family farms to increasingly large scale business" (p. xv).

Both critics and supporters agree that industrialization of agriculture is going to continue in many forms, in some places, but not necessarily in all places (Goldschmidt, 1978; Strange, 1988; Drabbenstott, 1995; Urban, 1995).

From the first pubic policy programs conducted on "agricultural adjustment" in the late '50s, there has been a long history chronicling the changes in farming, agriculture, and the places where that change has occurred. Each successive decade seems to have brought forth a new round of reasons why rural communities were "going to hell in a hand basket," yet we observe throughout rural areas communities that have been judged to be "successful" in coping with change and those that have not, even though the surrounding economic and natural resource bases seem very similar.

Strange (1988) contrasted the ideal family farming system and the industrial agribusiness system by the following characteristics:

Ideal Family Farming System	Ideal Agribusiness System
owner-operated	industrially organized
entrepreneurial	financed for growth
dispersed	large scale, concentrated
diversified	specialized
equal advantage in open markets	management centered
family centered	capital-intensive
technologically progressive	advantage in controlled markets
production process in harmony with nature	standardized production processes
resource conserving	resource consumptive
farming as a way of life	farmed as a business

pp. 32-39

Strange noted that neither of these ideal types exists; both are myths. He noted, however, that "the myth of family farming also offers a basis from which to recognize and evaluate other myths. The 'other' myth in agriculture is the myth of industrial agribusiness, a myth less romantic and more cynical, but no less compelling" (pp. 35-36). As becomes fairly obvious by sifting through the literature, it is well to keep in mind that both of these "myths" are often the springboard for advocates of either of these two perspectives, though as Strange noted,"...while we remain superficially loyal to the myth of family farming, we have become culturally and politically committed to the myth of agribusiness" (p. 36).

The earliest example of large-scale, vertical integration in animal agriculture occurred in the broiler industry more than 30 years ago. In the north central region of the country, the current, emotionally charged, example is industrialization of the pork industry. Most observers agree that industrialization will occur most rapidly in animal agriculture, but there will be developments in the cropping area as special purpose crops or those with identity preserved genetic characteristics become high demand items (Urban, 1995; Drabbenstott, 1995). It is, after all, only those commodities with high demand, high capital requirements, large net profit opportunities, and high technology applications that become candidates for industrialization or large-scale development.

Niche markets, a popular concept today, are only a comparative advantage to the small producers when the total market is too small to attract the investment of large amounts of capital. It is highly probable that niche markets for many products will be highly industrialized (in animals and crops) and operate outside the traditional commodity markets. This will have an impact on the potential for value-added efforts at the community level, but it will also potentially impact in a negative manner on those who are still tied to commodity markets at the local level.

Studies of Agriculture and Rural Community

What do the studies of the relationship between the structure of farming and rural community show?

Goldschmidt (1978) noted that "mechanization and industrialization production will inevitably come to dominate the rural scene in all America. Neither wishful thinking nor nostalgic

legislation will prevent this course of events" (p. xix). Drabbenstott (1995), when discussing whether state and local policies can stop industrialization, observed that "industrialization is too strong an economic force to be stopped by these governmental efforts." Drabenstott supported this conclusion by noting "a number of forces point to more industrialization ahead. Three will be particularly important: scale economies, new technologies that enhance coordination, and the emergence of strong 'integrators'" (p. 4).

Goldschmidt's original study of Dinuba and Arvin, two farming communities in California's San Joaquin Valley, concluded that"...by all odds, the factor of greatest weight in producing the essential differences in these two communities was the characteristic differences in the scale of farming — large or small — upon which each was founded" (p. 281). Dinuba, which was surrounded by small farms, had nearly twice as many business establishments, more than twice as many dollars of retail trade, more people per dollar of agricultural production, a higher average standard of living by families, more owners and less laborers, and more facilities and services than Arvin, which was surrounded by larger farming units. The conclusion drawn from these data was that the quality of life and, therefore, quality of the community, was better in Dinuba, which was surrounded by smaller farms than Arvin.

Others, Buttel (1983) in particular, have discussed some of the limitations of the Goldschmidt study and its central hypothesis. Buttel, in reviewing the literature of the connections between the structure of agriculture and the rural community, was more sanguine about the conclusions of earlier researchers, noting that "the character of the research that has been conducted has been inadequate to specify either the level or the spatial distribution of the gains that would be experienced by agricultural communities if public policy restrained the expansion of larger than family farm developments."

Buttel continued, "the founding literature (Goldschmidt et al.) was rich and detailed in its historical perspective, while the current literature typically has had little or no historical backdrop ... on the one hand, there has been a tendency to look toward imagined utopias of the past when assessing the results of analysis of recent data; in particular there has been a tendency to glorify the 'good old days' of family farming and bucolic agricultural communities. On the other hand, there is a strikingly different tendency, that of emphasizing imagined 'disutopias' of the past in some current research, particularly that written by economists..." (pp. 154-155).

Another limitation of the Goldschmidt study and others using similar approaches is the extrapolation of conclusions about the decreased quality of community in places like Arvin to an assumption that the quality of life of individuals in such communities decreases. There are many circumstances in which such a conclusion might not be warranted. The quality of life for many individuals and families would likely increase because of new, and in some cases, higher paying jobs associated with the industrialization of agriculture or, for that matter, new jobs in nearby communities that have no relationship to the changes in agriculture. In many communities, there may be new types of businesses and services that are actually of higher quality than before. The correlation between the number of types of employment in the community and the surrounding farming structure is not the same as it was four, three, or even one decade ago.

Two additional limitations of research (Buttel, 1983) are the failure of most of the research to "grapple effectively with the diversity within rural nonmetropolitan and agricultural America" and the assumption that community quality of life is unidirectionally affected by the farm structure. These are excellent points. With the possibilities afforded by telecommunications, both of these factors are more relevant today than a decade ago. There are numerous examples of companies that have located in rural communities which have nothing to do with agriculture, yet provide the base for many to continue to live in the rural community and, yes, maintain a small farming operation if they choose to do so. Cabela's in Sidney, Nebraska, is an example; Parson Technology (Intuit) distribution center in Hiawatha, Iowa, is another. The culture and ethnicity of the people in the community may also be a major determinant of how they view the changes and impacts on the individual and family.

Hobbs (1983), in comparing the 20 largest counties in Missouri (those with the most farms having over $400,000 of annual farm receipts) and the 20 smallest counties in the state (those with the most farms having $40,000 or less of farm receipts) found that "the large farm counties experienced an average of .7% population growth, and a 6% increase in number of business, from 1970-1980, while the small farm counties experienced more than 23% growth in population and 26% growth in non-farm businesses" (pp. 114-115). A number of the "large" counties do not have significant size towns with them nor in adjacent counties. Several of the "small" counties are adjacent to places providing employment opportunities. While there is an association of the factors described by Hobbs, the total explanation of the changes in business and population, the nature of the agriculture in the counties, is far from being definitive.

Catherine Lerza (1983) summarized the findings this way: "family farm-based communities have better social services, community life and small business sectors; communities surrounded by larger, non-family 'industrial' farms are marked by higher levels of poverty and economic inequality, fewer businesses and services, poor housing and community services, and a larger population of unmarried males and transients and the businesses that cater to them" (p. 27). This is not a universal outcome. In some instances where large-scale, mega farms are developing, there is an influx of population (labor) who is very family oriented and who derives much of the quality of life from within the family rather than the larger community. This new diversity in the population may be resisted and even resented by the indigenous population, and the natives may declare that the quality of the community has been negatively affected, but this is a reflection of monoculturism characteristic of many rural communities.

Heffernan (1982) stated that "it seems significant that a dozen studies, spanning four decades and all regions of the nation and performed by different researchers using different methodologies, have rather consistently shown that a change toward corporate agriculture produces social consequences that reduce the quality of life in rural communities" (pp. 340-341). It is perhaps noteworthy, however, that there are few longitudinal studies; and many studies use a prior state of being, the current state of being, and ascribe most of the change to the change in number and size of farms. Heffernan noted that "the research that has been done finds little alteration in the quality of life in rural communities that can be attributed toward vertical integration" (p. 340). Since much of the current focus on industrialization is related to vertical integration, this observation deserves attention.

Lasley (1994), in reviewing the studies over the past 50 years, concluded that "there is not a single study that has shown that movement away from the family farm agriculture is healthy for rural communities" (p. 4). It should be said, however, that the family farm agriculture of 1995 is quite unlike the family farm agriculture of the 1940s, '50s, or '60s. When speaking of the industrialization of agriculture today compared to 50 years ago, we are talking about a difference in degree and magnitude, but we are not talking about a new phenomenon. The rural community today that is "surrounded" primarily by family farms and, therefore, is presumed to represent the desired state of being would actually have been defined as the community surrounded by large-scale farming and, therefore, as undesirable just 30 to 40 years ago. That rural community of 30-40 years ago would have had more people, but not necessarily better education, higher quality of health care, better paying jobs, and access to the national and international culture. Life's chances would have been much more limited. Again, the general conclusion by many that the quality of community, and even quality of life of individuals, declines because of industrialization of agriculture is a slippery conclusion. Aggregate measures are deceptive.

Lobao and Lasley (1995) observed that a long line of literature from agricultural economics and rural sociology has addressed the effects of farm change on aggregate community well-being. Much of this has been aimed at testing Goldschmidt's (1978) hypothesis that community well-being is jeopardized by the growth of fewer and larger farms or, concomitantly, by the decline of moderate-size family farms. Such changes in farm structure have been reported to lead to declines in local population, lower standards of living, less community organizational participation and integration, decreased retail trade, and greater unemployment. However, according to recent studies, the relationship between farm change and community well-being is not so clear-cut. The effects of farm change have been found to vary over time and by region of the country, presence of local non-farm employment, human capital, and other factors (Lobao 1990; Lobao and Schulman 1991: Swanson 1988; Green 1985)" (p. 19).

MacCannell (1983) concluded "everyone who has done careful research on farm size, residency of agricultural landowners and social conditions in the rural community finds the same relationship: as farm size and absentee ownership increase social conditions in the local community deteriorate." Association of the factors in these studies seems not to be arguable, but the question is whether a major portion of the variance is explained by these factors, and even if so in the past, whether they would be so related now. I would suggest that they are not, but we need to have broad-based and current studies to better answer the question.

Lasley (1994) assigned the reasons for continued industrialization, especially the mega farm variety of industrialization, to two factors in particular. The first was the ability of the large-scale developments to externalize many of the costs to the community and the larger society. This can happen, but the impact varies widely. One should note that many of these same communities have deliberately externalized the costs of non-agricultural industrialization to induce firms to locate in the community. Though I do not have data to substantiate it, it would be my guess that large-scale farming operations have been less able to externalize infrastructure and other costs to society than have other sectors of business and industry.

The second factor is the widely discussed bias and commitment of the scientific community (read, land-grant universities) to the dominant industrial paradigm. I believe that there

has been movement by land-grant institutions in the last decade to give more attention to small farms, sustainable agriculture, and alternative agriculture, but would acknowledge that studies and educational programs in these areas are still a small proportion of the total research and extension agenda in most states.

Lasley also noted another reason for continuing industrialization of agriculture, namely, the capacity of the very large firms to create large total net profits at sizes far beyond the point indicated by the usual scale economies concept.

Consequences of Agricultural Industrialization

What are the consequences of agricultural industrialization on rural communities? Who benefits? Who loses? What is the nature of the benefits and costs? Are there differences in consequences from different types of agricultural industrialization or from industrialization in different locations? Are the impacts on the rural community of very large, regional cooperatives which have emerged in the last couple of decades, with few service centers, the same or different than the impacts of very large corporate farms?

One must also wonder, what is the difference in the impact of industrializing agriculture on rural communities versus the impact caused by "Walmarting" the countryside? Or, for that matter, "franchising" the countryside with Casey's General Stores, Pizza Huts, Hardee's, McDonald's or any of the dozens of franchise businesses that pay at or near minimum wage and extract all or a significant share of the profits from the communities in which they are located? Many of these types of businesses buy only land, labor, and utilities and pay property taxes in the communities in which they are located and "give back" very little by way of employment multipliers.

As Lasley (1994) noted, "Many parallels exist today in the emergence of industrial hog facilities and emergence of franchises and chains on main streets in rural communities. Many of the issues raised in the changing structure of swine production are similar to the concerns about the rapid expansion of discount chain stores, restaurants and service stations" (p. 9).

The issues that are raised by industrialization of agriculture and phenomena such as franchise and discount store operations focus on what happens to the community when there is a separation of ownership from labor, the movement of decision making from local to elsewhere, and the movement of capital (particularly profits) from the local area to national and/or international arenas. These changes can, and no doubt do, impact on the community, but a central question is whether the effects are unique to the movement to large-scale agriculture or are primarily due to agricultural industrialization. It seems very doubtful that they are unique.

The development of mega animal production (or, for that matter, mega crop production) operations in some rural areas introduces the possibility of another well-known phenomenon, namely, the consequence of "boom and bust" for the local community as has frequently happened with mining and other extractive industries. The likelihood of this happening with mega farm operations depends in large part on how dominant such operations are within the local area and the proximity to large population centers. Because of the environmental concerns, it would be expected, and it is verified in most cases, that such mega operations would occur in sparsely

populated places long distances from the nearest large population center, thus exacerbating the potential blow of a total shutdown of such facilities.

What is interesting to observe are the differences in community reaction to large-scale animal agriculture developments versus the reaction to large discount stores and franchise developments in the community. Many people, including many within the affected communities themselves, see the franchise and discount store developments as beneficial and contributing to the quality of goods and services locally available. In communities where such developments do occur, there isn't a need for as many of the new business establishments to provide equal or better service and selection than formerly provided by more, higher cost, family run businesses. Thus, measures of quality of the community (such as number of businesses) used by Goldschmidt (1978) and others may not be particularly relevant to assessing the quality of the community and/or the quality of life for residents and visitors. It is a hard truth, but if local people really believed that the mom and pop sources of goods and services were superior (regardless of the cost), many more of them would still be in business. One can observe the occasional cafe, grocery, furniture store, or other businesses that have defied the odds in rural areas because they have found a way to provide greater value than other types of establishments.

It is not just industrialization of agriculture that impacts rural communities. Pulver (1995) reminds us that "four changes are having a powerful influence on both rural and urban America:

* Most job growth is in the services-producing sector;
* The population of much of the developed world is aging;
* Small businesses are the primary generators of net new jobs; and
* Nearly all businesses are affected directly by the global economy." (p. 53)

To this list, I would add the impacts of information technology as a major factor which is and will continue to impact rural communities in many ways. Indeed, as Rifkin (1995) argued, "The coming together of the computer revolution and the biotechnology revolution into a single technological complex foreshadows a new era of food production — one divorced from land, climate, and changing seasons, long the conditioning agents of agricultural output" (p. 123). If the scenario painted by Rifkin occurs, we are, as he says, looking at the "end of outdoor agriculture" as we have known it. That, most certainly, has far greater implications for rural communities than anything we have seen to date.

These factors remind us that the impact on rural communities, including those in counties dominated by farming, is highly subject to the total economic, demographic, technological, and social change occurring in the nation and globally, not just those occurring within farming itself, albeit, those are important in some, but by no means all, rural communities. As Pulver (1995) noted, "The future is bright for rural areas that can effectively attract services-producing industries that expect rapid growth and provide higher paying wages. For those that are unable to do so, long term economic decline is all but assured." (p. 54).

Rural Communities

Much of the literature between the 1940s and the early 1980s about the relationship of farming changes to community life concluded that the quality of rural communities is better if surrounded by modest-sized family farms. *Is* it clear that the quality of life is better in rural communities which has many small, independent family farmers than in communities with either large family independent farms, substantial contract farming, or corporate "factories" which produce large volumes of animal units? Or is the problem simply one of CHANGE and the omnipresent fear and resistance to change? And, in the particular case of hogs, the very real environmental issue of odor?

Data from the 1992 Iowa Farm and Rural Life Poll conducted by Paul Lasley (1994) provided some interesting insights into the current controversy about the development of large-scale animal production operations. As he noted, "The issue of expansion of the livestock industry can not be divorced from the issue of **who** is expanding...Nearly one-third of the farm respondents were supportive of local farmers expanding their herds, about one-third were undecided, and the remaining one-third were opposed. However, when asked if non-farm investors should be encouraged to invest more money in their neighborhood to raise more livestock, strong opposition was observed. Nearly three-fourths of all farmers were opposed to outside investors raising more livestock....less than 10 percent were supportive." (p. 7).

What causes us to conclude that a rural community with smaller farms and many small businesses of the kind we knew in the 1950s and 1960s had an inherently better quality of life than is possible in those rural communities where there are fewer family farms, more and larger nonfamily corporate farms, franchise businesses, regionalized cooperatives, and/or large private sector agricultural firms that serve a larger area. Those of us who grew up in such places in the 50s and 60s or studied them in the 60s and 70s often heard how the communities of those days weren't nearly as "good" as the communities of the previous decades when the pace and scale of change was slower and smaller!

Just as there is a mythical quality to the notion of the family farm, there is a mythical quality to the rural community surrounded by these mythical family farms. Many original rural "communities" were basically "unintended" communities born of necessity because of lack of transportation, commerce, and communication made it necessary for the people in the town and surrounding area to solve their own problems. When these restraints were eliminated, much of what had passed as "community" also disappeared despite the fact that people continued to live in such places. Some communities, which most observers would judge to be "successful," have been able to create "intentional" communities, meaning they came together as a social system able to act as a collectivity to solve problems of common concern. More about this idea later.

For many rural communities, in areas dominated by agriculture (of which there are fewer and fewer), the real question will be what are the impacts of <u>not</u> having significant changes in the structure of agricultural production? Few will face the question of the impact of mega farm operations such as Premium Standard Farms in north Missouri. Or, to turn it around, for many rural communities in the Midwest, the choice is dealing <u>proactively</u> with the impacts of mega swine (or other animal) production versus <u>reacting</u> to the potential impacts of such developments. In some cases, the concern will not be coping with the impacts of large-scale animal production, but rather, the development of large-scale crop farms, as is the case in the bootheal of Missouri where there is virtually no animal agriculture present and the counties have experienced double-

digit percentage loss of farms (-13 to -23% in the six counties of bootheal) during the 1987-92 census period.

I'm not an apologist for all of the changes in agriculture that have happened or are going to happen in the future, but neither am I caught up in nostalgia for the "good old days." I spent too many days on a small farm in southeastern South Dakota during my first 20 years to be overly sentimental, let alone buy into the idea that such an arrangement provided a higher quality of life than is now the case for those who remain in the rural community.

I would assert that the quality of life in rural communities is much more related to what people want it to be and whether they are willing to work together to achieve their vision of the good community than it is on the particulars of resource use and ownership. I am much more likely to look to the emerging approaches to rural community development which engages people in the community to discover the common ground and the solutions to the issues which exist and then resolving the public matters in the public arena. We need to remember that *local* politics *is* the mechanism for solving differences in values about everything from land use to basic facilities and services. Many rural communities have not behaved in such a manner as yet. Some have. More are and will do so in the future.

Wilkinson (1995) observed that "a useful analysis of social forces shaping the future should focus, above all, on how well the needs of people who live in rural areas are served by the means available to pursue social goals" (p. 65). Even more cogent is his assertion that "rural communities too rarely, in fact, are 'communities'. Instead, rural places tend to be locations where particular problems and issues appear instead of *social units* where effective collective action occurs" (p. 66).

Two places in the Midwest (and there are, without doubt, many more cases that could be cited) that seem to have exhibited the characteristics central to "community" are Perham, MN, and Aurora, NE. In both communities, the emphasis has been on the development of home-grown, value-added employment that took advantage of the agriculture that surrounded the town as well as other resources to create a community with good jobs, community facilities and services, and leadership. Neither are communities in which it could be said that industrialization of agriculture has not occurred. One of the key differences seems to be power actors who see their role as "developers" of the total community rather than as "miners" interested in exploiting and extracting as much as possible from the community.

I believe there is an awakening in rural communities and a recognition by community developers and leaders that more people are willing to invest the effort to build participatory communities where local people take responsibility for change. Lappe` and DuBois (1994) refer to this awakening as "The Quickening of America," which means new life that sets the stage for growth and development of democracy to a new stage of "living democracy." In this "living democracy," everyday people are contributing to the solution of public problems. The awakening (or quickening) is encouraging. The challenge is trying to engage communities in this learning and discovery process before major external developments (agriculture or otherwise) are underway. Successful communities are identifying the deep, value-laden common ground and creating a vision and strategies for achieving the vision, based on capacity of the community rather than focusing on a list of deficiencies. The orientation, attitude, and involvement in creating and

achieving a vision is different from that associated with addressing inadequacies. That difference in orientation makes a difference in the outcome.

The work of Weisbord and Janoff (1995), *Future Search: An Action Guide to Finding Common Ground in Organizations and Communities*, also has much to offer to rural communities. It is "a work that has pulled together principles and practices for value-based action planning," which is precisely what is required for a community to be a community and to address the value-based issues that are at the heart of change, whether that change be initiated through industrialization of agriculture, information technology, or in the organization and delivery of goods and services.

Summary

So what are we to conclude about the consequences of the industrialization of agriculture on rural communities from the research that has been done? One is very inclined to say, it depends! From the vantage point of the 1990s, it seems apparent that most of the past studies have assumed that the rural town surrounded by small farms was the preferred state and set about the task of documenting that such instances did in fact represent a better quality of life. The number of variables included in many studies is so limited that the alternative explanations of the change that occurred and the possibility that there were gains for many in the communities have largely been ignored.

One interpretation of many of the past studies would be to declare that the state of farming and rural community was "ideal" at some point in time and that the quality of life for people in and from those communities has been in a permanent state of decline ever since. It is difficult to buy this construct. Let me offer a few observations regarding my reluctance to acquiesce to the notion that life in rural communities has been on a downhill slope since the day the first tool was adopted!

Most of the studies of the relationship between the structure of agriculture and rural community have focused on the impact of the changes in agricultural structure on the rural community where community was conceptualized as being one population center surrounded by farms. Fox (ca. 1964) posited a different type of "community," namely a multicentered place (called the Functional Economic Area) within which people met most of their social and economic needs. This created a different view from which to measure "community impact" of the changes in agriculture. Thus, the question to be asked is whether the overall quality of life in such a multicentered community (or multi-county area) has improved or declined as the number and size of farms has changed. Driving further for various goods and services does not automatically mean that one's quality of life has declined, though it could. Having fewer mom and pop stores to choose from does not necessarily mean that one's quality of life has declined, though it could, depending upon one's values. In many rural communities, the quality of life of people depends more on culture and ethnic factors than on measures of the number of businesses, volume of retail trade, or participation in public issues.

Lasley (1994) noted, "The controversy over swine expansion highlights the importance of 'culture' in the term agriculture. It appears the controversies are over basic differences in values, beliefs, and visions about farming, neighborhood, and community" (p. 11).

We need to give more attention to the fact that the original reason for many rural communities' existence disappeared decades ago even though people continued to live in such places. For much of the north central region, the distance between rural communities was originally tied to the mode of transportation: steam-powered locomotives that could only go about 15 miles between stops for fuel and water, the distance a horse and wagon could come and go in a day, the distance between needed stagecoach stops, the site of specific natural resources, or the entrepreneurship of those who hoped to create a town that would grow. Does anyone seriously believe that every town that was ever established in agricultural areas was or is a community that should be continued?

Madison County, Iowa, the locale of the best-selling book and the current movie, The Bridges of Madison County, at one time had 37 post offices! If memory serves me, there are now five; and all are growing because of the proximity to the capital city of Des Moines. It seems clear that each of the 37 places that someone once wanted to become a community could not survive very long. In many of the most rural counties that might once have had 5-10 "towns," it is also clear that all of those could not survive as a fully functioning community. As Flora et al. (1992) noted, "If some rural communities seem out of place, it is because we have forgotten the important role they once played" (p. 35).

But there is also a fundamental point to be made, and that is that it is the people who live there who make the decision as to whether they sustain a community. Historically, that decision has been made, not as a collectivity, but through the aggregation of individual decisions to leave, thus closing out the community and creating the "ghost town." Ghost towns are a well-known phenomenon in areas of mining, forestry, and sudden changes in transportation routes of the past. What is less recognized is the large number of such places that exist in the agricultural heartland. Iowa, which once had more than 1200 towns, now has about 950. Similar patterns exist in many of the states.

There is no doubt that the notion of small family owned farms around small towns continues to be a strong conviction and article of faith among many rural advocates. It is well to remember that historically, there was perceived to be such a strong connection between property ownership and the goodness of community that only those who were property owners were allowed to vote! This arrangement was once seen as the bedrock of democracy, the same democracy that is often cited as the rationale for restraining the growth of large industrialized farms. Only now, all who live in the rural community are expected to exercise their voting rights to reach such objectives.

Many of the studies cited have shown that the laborers of larger farms are less involved in community leadership, groups, and other community activities than those who are owners and operators of their own farms. What is so strange about this? It is concluded from this, and other data, that the quality of the rural community has declined. Perhaps so, but community participation studies have nearly always shown that people with less income, less education, and

lower skill levels have lower rates of participation in community organizations and fill a smaller portion of the leadership roles in the community. These same people may, however, have as high or higher levels of membership and participation in religious, social, and family related groupings. The ultimate quality of life question concerns the quality of life for people, not aggregate measures of community, though I do expect a relationship. The point is, we should be cautious in drawing conclusions about the well-being of individuals from broad-based measures at the community level that may only tap into a portion of the social interaction.

It is the nature of social and economic interaction that most people will seek their own self interest and support or make direct efforts to tilt the policies governing social and economic policy in their favor. It is also the nature of most people to seek "community" and to be willing to give up some of their power and capacity to control to gain the benefits of community. It is the participatory process and the policies at all levels which become the mechanism for determining the "rules" to play by. It is the change in technologies that continue to require changes in the rules and the rule-making processes.

Flora et al. noted, "Those who mine coal, farm, engage in other natural resource based activities also made choices. They did not choose where to be born, but they did choose where to stay and what type of occupation to pursue. If the circumstances under which those choices were made have changed, what responsibilities do those individuals have for their futures?" An excellent question. And I would submit that those who have chosen to stay (including those who feel they have no choice but to stay) have every right to try to create the policy environment which will be to their advantage, assuming they can agree on what that environment should be and the policies that would create it. But they also must accept the fact that those who do not believe or accept their version of better also have the right to try to create the policy environment which will be to their advantage. Such is the nature of change. The larger society, beyond individual circumstances and specific settings in which industrialization on a large scale is occurring, can, and likely will engage in the process, and bring their own collective view to the situation through "rule making" of various kinds.

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Consequences of Industrialization of Agriculture for Families and Community

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Sociologists have conducted a variety of studies on industrialization, particularly industrialization and control. While much of our research has focused on the labor process itself in terms of what happens to workers on the job, there have been several groundbreaking studies of the impact of shifting the organization and control of production on rural communities.

The classic study of the impact of shifts in firm organization and worker control in the United States is that of Gastonia, North Carolina, carried out by Liston Pope. I cite this historical study of community and industrialization rather than that of Goldschmidt, because many others, including Jan Flora and myself, have tried to operationalize Goldschmidt's study comparing a community with industrial labor relations with a community with a craft-type production system. However, much of the quantitative literature had to use secondary data as indicators of industrialization (size, both in acres and gross sales, capital investment, or type of ownership), which were at best only suggestive of what is meant by industrialization of agriculture. Further, except for McCannel's work in California, that analysis has used the county as the unit of analysis. Such a relatively large geographic unit provides too many alternative causal factors to make definitive causal statements. Goldschmidt's comparative study had the strength of comparing two communities with differential models of production (particularly different labor relations) at a given point in time. The historical approach gives insight into the *process* of a shift to industrialization and changing family and community impacts. It also allows for consideration of decision points and alternative choices that can be taken in response to global change. It also allows us to examine the shifting balance between a Jeffersonian view of property, that of creating virtue, to a Hamiltonian view of property, that of creating wealth (McEvoy, 1995).

In *Millhands and Preachers*, Pope traced the coming of the textile industry to Gastonia, brought in by the city fathers, small business owners, and professionals, including the clergy, who sought to build industry and morality in town by substituting a local value-added, craft-based, immoral enterprise (corn liquor) with a progressive, moral enterprise (also initially processing an agricultural product, cotton), funded by local entrepreneurs who thought of themselves as "agents of community welfare" (Pope, 1942: 16). Pope's careful historical work on the founding of the cotton mills documented that towns were willing to make almost any concession to obtain mills: taxes were kept low, rebated, restrictive legislation often was carefully avoided, natural and human resources of the communities were offered at nominal prices, and industrialists were accepted as pioneers and unchallenged arbiters of social and moral welfare (1942: 13-14).

The early capitalists were almost always local entrepreneurs, drawn from the same pool of town fathers who promoted community action favorable to the industry, who managed the plants they owned a part of. The workers were drawn from impoverished farmers, with a good work ethic (long hours with no complaints, highly reliable) and an aversion to organization. These

yeoman farmers in the mountains and Piedmont of North Carolina were no longer able to market their corn liquor (which they processed on their own farms and had brought to Gastonia for processing into fine whiskey, the most cost effective way to transport a heavy, low-value raw material).

He traced the shift of paternalistic worker management relations of the first mills with their workers and the communities (including investment in housing, churches, and other community amenities as well special concessions to individual workers) to more bureaucratic industrial relations as the financial crisis of overproduction induced by the war years of 1917-1919 followed by increased European textile production with the war recovery coupled with shifts in fashion using less material brought local owners close to bankruptcy as demand, and prices, dropped precipitously. Thus, "outsiders," Yankees and others from the east coast cities, purchased the mills, shifted their industrial organization to a Tayloristic model (deskilling labor and reducing the cost of labor in the process) and tightening the mechanisms of control through the stretch out, speed up, and substituting women and children for men (at much reduced wages) whenever possible. Concern for local virtue tended to decline on the part of the outside owners, indicated by lower contributions to the churches in the company towns, which they had previously generously supported. However, the ever-enthusiastic town leaders still used the moral argument to support the owners' interests, pointing out, among other things, the character-building aspects of child labor.

The resulting impact of outside ownership and tighter labor controls on the community was dramatic. Health conditions and economic and physical security declined, and worker turnover increased among the majority of community members (the workers). Class differences were exacerbated. Conflict erupted in a massive strike and the murder of strikers. National labor laws eventually curbed some of the abuses, and profit levels for investors recovered after the depression of the 1930s. A subsequent study (Earle, Knudeson, and Shriver, 1976) documented the increasing division of labor of the management and further removal of control from the community to corporate boardrooms as well as the racial divisions that were exacerbated.

Power's question about the meaning of industrialization in general and for agriculture in particular is critical. What are the indicators of industrialization in an industry? Are they the same in agriculture? Is it substitution of capital for labor? Agriculture in the United States has done that for 50 years across a range of farming systems. The result has been fewer farmers and smaller rural communities. Is it farm size and use of family instead of hired labor? Is it substitution of capital for labor? Is it a new type of labor and capital relations, with management and ownership two distinct functions, and contractual labor relations? Is it a globalized food system (Bonanno et al., 1994)? And why are we discussing industrialization of agriculture, when the industrial sector is striving to move to a post-industrial mode? The industrial model, best exemplified by Henry Ford's assembly line, bemoaned the fact that hands had people attached. Yet the move to soft systems analysis in many industries suggests that the people factor is critical for competitive production and that there are alternative ways of organization that can be competitive.

Thus, I want to focus on a post-Fordist agriculture, using Drabenstott's definition of industrialized agriculture. That allows us to focus on alternatives and the importance of soft systems in becoming and remaining competitive in a global economy as well as assessing the possibilities of more local food systems. These alternatives of organization to reach the post-

Fordist agricultural model will have alternative impacts on communities. Thus, let us look at a move to a post-Fordist agriculture as

from commodities to products
from markets to tightly integrated supplier chains

The problem becomes that link between producer and end user and the flow of information between them. Control of that linkage, and the role of the local community in providing it, will determine the well-being of local communities.

The move to a post-Fordist agriculture will result in destandardized production processes; enhanced production flexibility; highly skilled, versatile producers, managers, and workers; high quality standards; the ability to serve niche markets; and continuous process and product improvement. This is not something that occurs only on the farm, but throughout the supplier chain. Depending on how communities can organize to be a major part of that chain, the more likely that financial capital will remain in the community and that human capital and environmental capital will be enhanced and social capital developed.

High-performance work organizations are becoming the model for the new economy, the post-Fordist economy. Fordism came about with the assembly line, producing a standard product. The term comes from Henry Ford and his automobile. You could get any kind that you liked as long as it was a black Model T. That was the commodity produced, and it was a quality product at a low price. That represents the old, industrial economy and the old approach to agriculture. The new economy moves from commodities that are undifferentiated, oriented toward a mass market, to differentiated products oriented to very specific markets and produced to meet those market needs. The market needs can be widely defined to include the needs of the family and farm household, the needs of the rural community, the impact on the environment, as well as the ultimate consumer of the product produced by that enterprise. In other words, production of virtue (supported by local, state, and federal policies) as well as wealth can be part of a post-Fordist agriculture. Post-Fordist agriculture must move beyond producing commodities to producing products, which can be priced to be environmentally sound and socially beneficial over the long term.

Currently, under commodity production (Fordist agriculture), a series of intermediaries or “middle men” buy and sell commodities and are concerned less with the absolute price than margin or commission. This feels comfortable to many farmers, as managers of the local grain elevator or sale barn are known. But both mechanisms represent loose links to end users, with major transaction costs involved which often channel decision making and profits outside the community, despite the security of local institutions as the first stage in the intermediary process. In a post-Fordist industry, there are tightly integrated supply chains as the product is produced with a specific user in mind, and that user has committed to purchase the product before its production. Agriculturalists and rural community institutions must be organized to develop those networks, rather than merely supply them.

Because of the need to be flexible and attuned to the changing markets, as well as increasing knowledge of the economic environment, post-Fordist industry will move from a

standardized to a de-standardized production process. Agriculturists and processors must move from cookbook farming to location-specific farming based on increasing knowledge of the physical and social as well as the economic environment. Value added will not just be converting corn to pork through hogs to be slaughtered at the multinational packing house for mass meat markets, but specific products aimed at specific markets. However, the possibilities for rural communities to be part of a tightly integrated supplier chain depend on changing some of the rules that were made by and favor large-scale, Fordist production, particularly standards for quality that stress means (capital intensive infrastructure) over the end (safe food).

In Fordist industry, the production process was designed so the individual did the same thing over and over and over. Manual work was separated from mental work, and the workers were easily replaceable, hopefully with minimal time spent in training. Parts of the food chain are working hard to do this, as in meat processing. The close link between production and processing to produce a uniform carcass allows for less-skilled (and lower-paid workers) in the packing plants. Post-Fordist industry demands highly skilled and versatile workers. These individuals, whether owners, managers, or workers, or all three, enhance the human capital of rural communities.

Fordist industry, and Fordist agroindustry, found a good product and an efficient way to produce it and stuck with it. “If it ain’t broke, don’t fix it.” Innovation only occurred at the margins. Post-Fordist industry and agroindustry constantly strove for continuous process and product improvement. The production process must be constantly improved rather than be fitted into the comfortable routine of conventional farming and marketing. The rural communities organized to consider alternatives and deal with discomfort will be able to participate in the consistent improvement necessary, rather than have it dictated to them through contracts designed to deskill the worker and separate management from ownership, as the land-owner bears the investment risk.

Depending on how post-Fordist agriculture is organized, which depends on a variety of choices at many levels, communities can proper or decline. The "rules of the game" make production of commodities extremely profitable, for those who market them. Deficiency payments allow grain companies to purchase raw materials at low prices. Export enhancement payments generate extra profit if a large surplus is generated for foreign markets. And "soft" loans to selected countries, guaranteed by the U.S. tax payer, guarantees an effective demand. (Note: Hunger is not the same as effective demand.) Once these conditions change, what is profitable for whom will change as well. That change gives an opportunity for rural communities, of whom farmers could be members, a chance to redirect production and profit. Unfortunately, most farmer’s organizations are oriented to the federal, not the local level, so farmers are often not prepared to organize for community-based initiatives.

If agriculture moves to post-Fordist model (rather than the Fordist model that is being promoted by those who profit most from the current system), there will be much less stratification and differentiation in what is done on the farm and off the farm. Like the very successful flexible manufacturing networks, the rural communities and agriculturalist will have to develop flexible agricultural networks that allow sharing information that occurs in the variety of sustainable farming associations that exist across the state and sharing and developing expertise in marketing and management.

All those involved in the enterprise will have to be involved in these decisions for continuous process and product improvement. This is particularly important for sustainable agriculturalists, because the product is that which is marketed and of environmental quality. Decisions in sustainable agriculture have to be made by the person confronted with the problem. Farms will be run in a more democratic fashion. The information provided to agriculturalists will come from working together with colleagues and partners rather than provided by the source of information giving the answer to the problem. Research and extension must restructure to be responsive.

Post-Fordist industrial organizations depend on workers' sharing the vision and the values of the firm. They need to be committed enough to make the extra effort required. They work for personal satisfaction as well as income. Workers spend a lot of time in teams developing a shared vision. Sustainable agriculturalists and communities reflect about what they do and why they do it. They articulate their philosophy and vision as individuals, households, and community to have a basis for their production decisions and reasons to carry them out.

Finally, the reward system will also be different. Because assurance of a base level of income due to the close links between production and the consumer, the agriculturalists and rural communities will also learn to budget with flexibility because of a shifting market as well as environmental conditions. The sustainable agriculturalist already knows to plan for the worst year rather than the best year, and this is what allows them to both protect the environment and sustain rural communities.

If we can learn from the post-Fordist industrial model not that bigger is better, but that the way we organize, the way we think, and the way we attempt to constantly improve based on what we value and where we want to go, rural communities can become more sustainable. Virtue as well as wealth can be created. But if we are sold the Fordist model of industrialization, with the focus on commodities, spot markets, and national linkages to the exclusion of local organization, rural communities with close links to agriculture will indeed differentiate further along class lines, which, given the current context, will tend to be racialized, internal strife will increase, and Gastonia will be the rural community of the future.

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Chapter 5

Reaping What We Have Sown: Public Policy Consequences of Agricultural Industrialization and the Legal Implications of a Changing Production System

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I. Introduction — What Do We Mean by Industrialization?

The impact of industrialization on American agriculture is a topic of great significance to farmers, lawyers, and society alike. An earlier article, "Agriculture Without Farmers?"[1] addressed three main issues implicated by industrialization of food production: the role of farmers in an industrialized agriculture, the impact on building sustainable agriculture systems, and reasons why society must address the implications of industrialization. A central question is whether the forces stimulating industrialization can be harnessed to improve all parties affected by the food and agricultural sector: consumers, farmers, and businesses alike, or whether it will simply be another means to increase the profits and market shares of the companies promoting it, while further eroding the role of farmers and compromising the interests of consumers.

The purpose of this article is to consider industrialization from the perspective of public policy by identifying and addressing legal implications associated with the change. The article considers ten different areas of agricultural law and policy which illustrate statutory or judicial questions raised by industrialization. The article considers how the move toward industrialization is furthering the divisions within the structure of agriculture and concludes by discussing the implications this segmentation may have on public policy.

Before turning to the discussion, it is important to clarify the term in question. An article dealing with "industrialization of agriculture" must recognize that the term is susceptible to as many meanings as is "sustainable agriculture." Perhaps both ideas are like what the jurist said about pornography, you know it when you see it.[2] Everyone involved in the food and agricultural system in the United States can see the industrialization of agriculture.[3] Certainly the trend is very apparent in Iowa and across the nation in the range of contentious issues relating to the changing structure of swine production.[4] These issues include

- the concentration of production into large units,
- the increase in integrated or corporate, non-owner operated facilities,
- the geographic shift of production to non-traditional areas, and
- the increased use of hired labor or contract growers.

Associated with these trends are a variety of social and economic issues, most notably environmental and odor concerns.[5] The controversies surrounding construction of new large-scale production facilities have triggered numerous land use disputes, a variety of lawsuits, and calls for new rules and legislation.[6] The resulting societal divisions have heightened political tensions in

communities throughout the region and complicated the lives of pork producers and their organizations.[7] The recent spill of over 25 million gallons of swine wastes from a North Carolina lagoon[8] and the leakage of 1.5 million gallons from an Iowa lagoon[9] are the unfortunate, but predictable, consequences of the changes in swine production, too much waste stored either in poor locations or in improperly constructed facilities. These episodes may also serve as bellwethers for opponents of large production who will argue the episodes illustrate the environmental consequences resulting from industrialized production and the need for increased regulatory controls.

In addition to the environmental issues, there are a range of other social and economic concerns related to industrializing swine production.[10] At the producer level, these concerns include market access for independently produced swine, the fairness of contract terms, the adequacy of the price discovery function in the public marketplace, the availability of the premiums from packers to large integrated growers, cost and availability of "improved" genetics, and changes in traditional price cycles in swine markets. At the community level, besides the environmental issues, there are questions about the location of processing plants, the social issues relating to the influx of a large non-traditional work force, and the economic effects of shifting ownership of swine from a diverse set of local owners to concentrated group owners who are often non-residents.

Collectively, these are just a sampling of issues related to industrialization of one segment of U.S. agricultural production. The issues are listed not as a litany of ills as each issue has two sides to the debate, but instead to illustrate that to consider the possible public policy consequences of industrialization, we must first recognize the relevant public concerns to which policy and law may be asked to respond.

On its face, the term "industrialization of agriculture" poses a threat to traditional farm interests, in the sense it will change both the structure and independence that have made farming the satisfying occupation cherished by producers.[11] Industrialization may result in an extension by processors or suppliers into production, primarily through contracting, in ways and to a magnitude not previously experienced. It will have many consequences, not the least of which may be that by blurring the distinction between farming and industry, society's perception of the very function and nature of farming may change, causing a re-examination of "what is agriculture" in both a legal and social context.[12]

This does not mean an industrialized agriculture must necessarily threaten farmers' interests; that will be a function of how it takes shape. But it is important to recognize several points. First, any additional profits associated with industrialization will not be shared equitably with farmers unless the crops or livestock are produced or marketed in ways which guarantee the sharing. Second, while there are many common interests between the farm community and agricultural industries, their interests are not identical; and on many issues, not the least of which is price, they conflict. New reports in early 1995, noting how increasing grain prices were a threat to agriculture, illustrate how the interests of farmers and integrated producers have blurred. Historically, on the author's grain farm in southwest Iowa, rising grain prices were never viewed as a threat.

II. Considering Ten Examples of the Policy Consequences of Industrialization of Agriculture

Public policy will be a fundamental determinant in shaping "industrialization." Whether the issue is interpreting the contracts used to integrate production, structuring new businesses such as farmer cooperatives, or protecting the interests of consumers, law will play a central role in shaping society's responses. In many ways, the development of these laws and policies will represent society's answer to the question posed about social migration by John Steinbeck in *The Grapes of Wrath*, "what is to be done about it?"[13] The impacts from the shift will be felt across many issues: the type of farm programs we have; the role of farm groups and how they relate to members; and the methods by which commodities are produced, priced, and marketed. What follows is an inventory of possible public policy consequences of industrialization.

A. Contract Production: Perhaps the most directly identifiable legal impact of "industrialization" is the increased use of contracts to control production and marketing of commodities.[14] Contracting has been used historically with specialty crops and poultry and is increasingly used with swine and grains. Contract production, now being promoted with "value-added" and "identity preserved" grains, may hold the promise of new markets and price premiums. But increased use of production contracts will raise many new legal issues, including the fairness and interpretation of the contract terms, satisfaction of contract specifications, risks of non-payment,[15] and the role of state law to protect the interests of farmers. Minnesota is a leader in adopting laws and regulations to promote fairness in agricultural production contracts.[16] Legislators in other states will no doubt be asked to consider similar laws.[17]

Contract production arrangements will tie producers to marketers of specialized genetics and to processors, perhaps changing the traditional methods of marketing, pricing, and payment for grain. Contracting has been described by some as "risk sharing."[18] If so, the law has an important role to play in ensuring that contracts in fact are risk sharing and not just risk shifting.[19] Producer access to contracts, the level of integrator control, and mechanisms to resolve disputes and insure payment are all legitimate policy issues which may need to be addressed in legislation.

2. Labor Issues. Contract production and other forms of industrialization implicate a variety of labor issues. Contracting methods may result in a fundamental shift in the nature of the farmer's work. Instead of being independent businesses, farmers may come to resemble wage employees, only paid on a piece-work rather than hourly basis. However, under most contracts, the farmer is not legally an employee, but is an independent contractor[20] and thus is not protected by worker’s compensation or other employee benefits commonly required in other industries. The implication of this for society is that while supporters of industrialization argue it leads to greater efficiency and lower food prices, those "savings" may be gained in part by exposing agricultural workers, and now the farmers in an industrialized system, to types of economic and health risks society will not countenance in other "industries."

Another significant impact of the increased use of contracts is on producer organizations which will feel pressure to evolve. Issues such as working conditions for growers, price bargaining for contract terms, and levels of compensation may become as important as market promotion. Farm organizations will face pressures to function more like labor unions, as is the situation with many European farm organizations. The growth of the National Contract Poultry

Growers Association as a counterbalance to the power of the poultry integrators is an example of the new style of farm organization in the United States.[21] The federal Agricultural Fair Practices Act which prohibits integrators from terminating growers due to their organizing activities illustrates the protections which law may give producers.[22]

3. Biotechnology and Genetic Engineering: A common assumption in U.S. agriculture is biotechnology will expand the range of crops produced and their potential uses. If this proves true, then biotechnology will be a central component of "industrialization." The ability to more rapidly adopt new technologies is often offered as a justification for industrialization.[23] Biotechnology may hold the key to answering the world's nutritional needs and may bring riches to the companies who create and market them. But will it mean new profits for the farmers who raise the crops?

Farmers view access to improved seed the same as seed companies. If plant breeders produce better, higher yielding seed, then farmers and the companies will prosper. But as genetic engineering creates the potential for "added value," it is only natural the companies developing the new crops using their research funds to add the value will protect their financial interests. Companies will look for ways to claim rights farther along the production flow of a crop to capture the value they contribute to return it to investors. Companies will not be content to just sell improved seeds or breeding stock. Instead, they may look to control production of "value-added" crops so a portion or all of the enhanced value goes to them.[24] This trend is clear in both livestock and crop production as exemplified by the increased use of production contracts which control ownership of the underlying parent materials.

4. Intellectual Property Rights and Agricultural Genetics: The question of who will benefit from improved genetics will be largely determined by intellectual property laws. The United States leads the world in recognizing intellectual property rights in living materials.[25] The 1930 Plant Patent Act protects breeders of asexually reproducing plants, and the recently amended 1970 Plant Variety Protection Act gives breeders of sexually reproducing crops patent-like protections. Hybrid seed breeders may also use the law of "trade secrets" to protect parent lines. Under a 1980 U.S. Supreme Court ruling, the U.S. Patent Office has granted "utility patents" for hundreds of plant varieties. Just three years ago, Agracetus, of Madison, Wisconsin, announced it had received a U.S. patent for "all genetically engineered cotton."[26] Early in 1995, Mycogen received a patent on all crops using synthesized Bt for pest protection.[27] These developments indicate how far patenting of crop genetics may go. But the trend is not without critics. In December 1994, the U.S. Patent Office canceled the Agracetus cotton patent, in part due to concerns from the agricultural sector.[28] Does granting "patents" on new crops always benefit agriculture and society? Will a scramble to claim ownership in plants further erode public plant breeding? These are among the difficult public policy issues industrialization could cause society to consider.

The most immediate example of how intellectual property laws affect farmers is the recent controversy over the "farmer exemption" to the Plant Variety Protection Act (PVPA).[29] The right of farmers to save protected seed and sell some to other farmers was recently before the federal courts in an alleged illegal "brown bagging" case from Iowa. The case originated in the Northern District of Iowa where the federal court ruled the "farmer exemption" was limited to the amount of seed a farmer needed to replant a crop, with any allowable sales being made from what was left

of the saved seed.[30] The U.S. Court of Appeals for the Federal Circuit reversed and held the farmer exemption allowed a large quantity of seed, perhaps as much as one-half of the amount produced, to be saved and sold to others whose primary occupation was farming.[31] The case went to the U.S. Supreme Court which on January 18, 1995, in an 8-1 opinion, interpreted the "farmer exemption" narrowly to limit the amount of seed which can be saved and possibly sold by farmers.[32] While the Winterboer litigation was underway, the seed industry asked Congress to limit the "farmer exemption" to prohibit such sales by farmers, in part to bring the United States into compliance with the 1991 amendments to the international UPOV agreement on plant breeders' rights. In the fall of 1994, Congress amended the PVPA to restrict the ability of farmers to save and sell protected seeds.[33] Intellectual property laws for biotechnology are an international issue as seen in continuing U.S. opposition to the Biodiversity Treaty and inclusion of such provisions in both the GATT and NAFTA agreements.[34]

5. Land Stewardship and Environmental Attitudes: A central issue facing many farmers today is the public's increasing demand for greater environmental protection from agriculture. The impact of industrialization on this issue is an open and important question. Will it change the relation between producers and the land? Will the land be viewed only as a production factory for maximizing yield, rather than a long-term resource to protect?[35] Or will industrialization provide farmers with higher incomes and new technologies making environmental compliance more possible?[36]

The question of how "stewardship" is handled in an "industrialized" agriculture will have direct implications on environmental law. One impact of industrialization could be for the environmental community to promote the use of regulatory approaches for agriculture.[37] The theory is as agriculture becomes industrialized, it should be treated like the "industrial" sector, meaning the "command and control" style of environmental laws applied to "smoke stack" industries should apply. Traditional arguments against using this approach will diminish. For example, an industrialized agriculture will be better able than farmers to pass the costs of environmental protection on to consumers as higher prices. Support by farm organizations, such as the American Farm Bureau Federation and the National Cattlemen's Association, for "takings" legislation, which would restrict society's ability to protect the environment and open public treasuries to essentially unlimited damage claims by landowners, do little to portray farmers as the stewards of the environment they claim to be.[38]

6. Financing and Marketing: Financing and marketing agricultural production will be affected by industrialization in several ways. First, processors integrated into production may have an advantage in obtaining financing because of lenders' willingness to finance larger entities. Second, companies marketing inputs or integrating into production will become increasingly involved in the direct financing of production expenses, as seen with John Deere's and Pioneer's extensive credit operations and the role of swine integrators in financing constructing new buildings. A related issue will involve the packaging of proprietary technologies. It may become increasingly common for farmers to face such business requirements as: if you buy our seeds you must use our pesticide or if you breed our gilts you must slaughter at our plant. The increased market power created by industrial agriculture may result in re-examining how anti-trust laws apply to the sector.[39]

7. Cooperative Action by Farmers: Many experts point to industrialization and note the increased profits possible for the farmers who get on board now. No doubt, there is money to be made in agriculture or at least from agribusiness, or in farming the farmer as my father used to say. But it is important for farmers to realize they will have to work to receive a portion of any increased economic returns. There is no reason producers should expect companies industrializing agriculture to "share" their increased earnings, beyond the minimum required; they are not charities. If it is no more difficult to raise a bushel of high-oil corn than commodity corn, why should farmers be paid more to do so?

To profit from industrialization, farmers will need to either earn it through providing better quality products or assuming new risks or to gain it through market power, negotiation, or developing the markets themselves. As the economic activity of agriculture continues to shift to what happens beyond the farm gate, the economic interests and power of farmers will continue to wane.[40] If farmers desire market access and maintaining control over marketing their products, then a new interest in cooperative action must occur.[41] Recent examples of new farmer-owned cooperatives in North Dakota, Iowa, and Minnesota may be evidence of increased interest in cooperation, the traditional vehicle used by producers to "industrialize" production up toward the market.[42]

8. Tenancy and Land Ownership: Will industrialization accelerate the trend to separate land ownership from operation?[43] Concentration of production and development of capital-intensive production methods may help to fuel the exodus of producers out of agriculture. The increase in farm size has been accompanied by an increase in tenancy as more land is in the hands of non-farm heirs or is sold to non-farm investors. The current demographics of farmers show in the next decade a large portion of farmland may be transferred.[44] The combination of financial obstacles to beginning new farms and an "industrialized" agriculture which relies on access to production contracts and large investments in buildings and equipment may mean more land concentration and tenancy. Increased tenancy will make the lease arrangements used more important[45] and will exacerbate other associated societal concerns such as stewardship and the effect of rural economies.

These shifts will increase the need to develop effective ways to pass farming operations on to non-family members as intact operations. Too often, the traditional result if there is no heir to take over the farm is to sell or lease the land, auction off the equipment, and raze the house and buildings, making the continuation or re-establishment of the farm nearly impossible. Matching programs for retiring farmers and those who want to start farming, such as Nebraska's Land Link and Iowa's Farm On are small but important steps to changing customary thinking about transferring farms as going concerns.[46]

A policy area obviously affected by industrialization concerns the laws limiting corporate farming, some form of which is found in nine midwestern states.[47] These laws are arguably the most visible form of state policy designed to address a feature of industrialization. But some states must deal with current forms of integration, such as contracting, using laws designed to address land ownership.[48] Proponents of expanding industrialization are pressing for reform of the laws.[49] Several states, including Kansas, Missouri, and Oklahoma, have modified their laws to become more attractive for integrated livestock production, adding interstate competition to the debate in the livestock sector.[50] The economic stakes are high in the fight for shares of a shifting agricultural

production system. Iowa has historically led the nation in swine production, accounting for over 25% of swine marketed every year. But Iowa officials now worry about the rapid growth in swine production in states such as North Carolina.[51] As a result, fear of bearing any responsibility or potential blame for "losing the hog industry" to another state makes Iowa lawmakers and other public officials fear open debate of legitimate issues concerning the structure of hog production.[52]

9. Impact on Farm Policy Development: The move toward industrialization agriculture will also be reflected in changes in farm programs. Export and production policies will become more oriented to full-scale production and expanding export markets, with conservation and environmental concerns being given less consideration.[53] This will be true for several reasons. First, making farm policy will be increasingly dominated by processors and suppliers who control agriculture through contracts and other marketing arrangements. Input suppliers and marketers have historically favored full production and export reliance. Second, developing "industrial crops," which find value primarily in increased demand, will motivate producers and processors of the crops to support full-scale production. The controversy over alternative fuels policy and ethanol is an example of this. Recently completed negotiations of NAFTA and GATT are in many ways the "industrialization" of national policy toward agricultural exports.[54]

One direct effect of industrialization could be on the current conservation programs which rely on the interest of producers in remaining eligible for farm program benefits as well as on long-term land retirement programs such as the CRP.[55] Many politicians are arguing for extensive reforms or eventual removal of traditional farm programs, even though the programs are the vehicle through which federal soil conservation efforts are delivered.[56] If federal price and income support programs no longer exist or are economically unpopular with producers, then how will we protect the soil? There is no reason to assume farmers will abandon conservation plans if price supports and cross compliance do not exist, but there is equally no reason to assume the public desire and demand for clean water and protecting soils will disappear just because farm programs do. Agriculture should use public desires for environmental protection as the basis for claiming public funds to support farm programs. Failing to do so may mean farmers will face mandatory programs to insure soil conservation and protect water quality, but without public funds to share the burden.[57] Recent efforts to develop "green payment" schemes for replacing traditional federal farm programs deserve greater attention.[58]

10. Consumer Acceptance and Public Attitudes: It is hard to predict how industrialization will alter the public's view of the agricultural sector and the quality and safety of the food supply. Perhaps the claims of efficiency and lower prices will satisfy the public, especially one less understanding of agriculture. But several developments associated with industrialization could damage public attitudes of agriculture, as it separates farmers from the land and continues the nation's movement away from a perceived "family farm" structure. Reliance on new techniques and inputs, for example, genetic engineering of foods, raise related safety and ethical questions, now being used by activists to attack agriculture.[59] Processors and marketers are often the forces urging the lessening of government regulation. The current debate over food safety, whether in the recent effort to delay the USDA's proposal on meat inspection or the debate over reforming the Delaney Clause, illustrate how the desires of the food industry and the interests of consumers and producers are not the same.[60] Consumers want a safe food system, and producers who raise quality products do not benefit when consumer confidence in food is adversely affected

by health problems related to processing and marketing methods. Perhaps the public's response to industrialization will yield the surprising truth that consumers don't always want their food cheaper if the trade-off is in quality or health risks or in damage to the environment or society.

III. As Industrialization Divides Us, Will a "New Agriculture" Emerge?

The longer-range impacts of the trend to an industrialized agriculture raise important questions for society. One question, put in academic jargon, is what will be the structure of a post-industrial agriculture? In other words, what is agriculture going to look like when it is done being industrialized? Will it be the efficient utopia of "super-farmers" noted by Urban and other agri-business executives, the agriculture of "Buck Rogers" where everyone drives their satellite guided tractors to "farm by the inch."[61] Or will it be an agriculture increasingly dominated by the handfull of companies, which produce, process, and market our food, the companies who make the decisions and the profits while millions of workers toil for small wages?

Only time will tell what industrialization will bring; but from my viewpoint, the agriculture of tomorrow will have at least three main parts. The first will be the "industrialized portion" most notably like the broiler industry and any other forms of livestock or commodity production which follow this model. The role of traditional family sized "farmers" in this sector will be limited, reduced to "employee-like status" in an increasingly corporate-owned, concentrated, and vertically integrated system. In addition to industrialized firms, this sector will also include large family farms making greater use of hired labor. This sector will account for the bulk of production, especially for grains and meats.

The second sector might be described as the mixed middle ground. This will be made up of the traditional family farms, perhaps larger than before, trying to compete or at least exist in the industrialized system. Producers will be using contracts to seek price premiums, but may also be increasingly linked in marketing cooperatives or networks. A common characteristic of these producers might be uncertainty about their future in agriculture. The question many farmers may face is "do I take the Leap (and the debt) to become a mega-sized facility or do I get out now? “Older producers may be simply hoping to ride it out until retirement. For many farmers, a factor in their decision may be that the combination of economic pressures and changing societal attitudes toward agriculture mean much of the fun and satisfaction has been taken from farming.

But as an optimist, I see a third group of producers emerging. These are farmers devoted to producing and marketing quality food, often in ways which today might be considered non-traditional. This group will include smaller scale diversified producers[62] and niche marketers, many working off the farm as well, who produce and market high quality foods,[63] often for direct fresh consumption at higher prices.[64] These are the farmers who will sell wholesomeness and the traditional image of American agriculture[65] and who will reap a larger share of the consumer food dollar by doing so. Whether it is higher value foods such as organic produce,[66] specialty crops, or unique marketing methods, such as community supported farms,[67] these producers will be noted by an increasing attention to quality products and direct marketing.

One key focus of this group is linking the consumers of foods and the producers who raise it.[68] Another common concern of these farmers is accepting responsibility for the quality of food

they produce and for protecting the health of their land.[69] In these common characteristics and through higher returns, these producers find optimism about their futures in agriculture.[70] These farmers will fill the role of the traditional family farm, independent operators, concerned with stewardship of the land, taking responsibility for building strong local communities,[71] who preserve and honor the history of agriculture[72] while creating their own future by raising and selling high quality foods locally.[73] For lack of a more original term, I call this development The New Agriculture. Promoting the profitability of farmers who take this road offers some of the most exciting issues in public agricultural policy.

IV. Conclusion: The Role of Public Policy in a Segmented Agriculture

There are obviously many implications for public policy if such a segmentation of production should occur. From a legal standpoint, the industrial sector will demand regulation due to the possible economic, social, and environmental impacts such concentration of market power might have. This re-examination is already occurring as reflected in recent statements of the Secretary of Agriculture and as seen in the recent Justice Department investigation of companies in the corn milling industry.[74] As to the middle ground, in many ways it is this group that is most threatened by industrialization, but it is also this segment for which most of current agricultural policies were written. The issue will be whether these laws, such as federal farm programs, retain relevancy or effectiveness in a changing agricultural structure.

The "New Agriculture" should deserve support through public policies as it is perhaps closest to the Jeffersonian agrarian ideals which historically shaped U.S. agriculture.[75] It was to aid small farmers such as these which led to creation of many of the traditional agricultural institutions, such as Extension and the Land Grand system. Today these institutions are struggling to adjust to industrialization and, in doing so, define a continued relevancy for themselves in a changing agriculture.[76] Whether these institutions can be harnessed to support or recognize the "New Agriculture" is an open question. Failure to do so may mean that in an industrialized agriculture, there is little need to justification for them.

In conclusion, it seems clear consumers have an unlimited capacity to want their cake and eat it too, in the form of plentiful, nutritious, food produced in an environmentally sound manner by family farmers, but for lower prices and a shrinking percentage of their incomes. The farm sector's struggle to acquire a fair share of the price paid for food has been the historic quandary of farming. The irony may be that when agriculture is finally organized in a manner to demand or extract a fair share from consumers, as many believe is the ultimate goal of industrialization, control over food production will have slipped from the grasp of farmers. Only by aggressively asserting their interests to receive a fair price and profit for their production and using legal mechanisms to do so can American farmers ensure that "industrialization" is not simply the latest chapter in the decline of farming as the independent ideal cited by Daniel Webster in 1840 when he said, "let us never forget that the cultivation of the earth is the most important labor of man. ...When tillage begins, other arts follow. The farmers, therefore, are the founders of human civilization."[77] Perhaps the quotation by St. Paul inscribed on the USDA Building should be our guide: "The husband that Laboreth must be first Partaker of the Fruits."

ENDNOTES

1. See, Neil D. Hamilton, Agriculture Without Farmers? Is Industrialization Restructuring American Food Production and Threatening the Future of Sustainable Agriculture? 14 *Northern Illinois University Law Review* 613 (Summer 1994)

2. The famous remark about pornography, "I know it when I see it," was made by Justice Steward in a concurring opinion in Jacobellis v. Ohio, 378 U.S. 184, 197 (1964). For a discussion of the comment and the United States Supreme Court's jurisprudence on obscenity and pornography, see Hunter R. Clark, Justice Brennan: The Great Conciliator, Birch Lane Press 1995, pp. 198-199.

3. For a discussion of the definition of industrialization, see Hamilton, note 1 supra at pp. 663-639.

4. For a discussion of the recent changes in the U.S. swine industry, see Leland Southard and Steve Reed, "Rapid Changes in the U.S. Pork Industry," ERS/USDA, Agricultural Outlook, March 1995, p. 11. See also, Steve Marberry, "Structure is real issue facing mega farms," Feedstuffs, Sept. 5, 1994 p. 16; and Chris Hurt, "Industrialization in the Pork Industry," Choices, 4th Quarter 1994, p. 9.

5. The situation in the Iowa swine industry even made the front page of the Wall Street Journal, see Scott Kilman, "Iowans Can Handle Pig Smells, but This Is Something Else," *Wall Street Journal*, May 4, 1995, p. A1.

6. See, e.g., Kenneth Pins, "Feds may alter tax law to limit large hog farms," Des Moines Register, July 27, 1995, p. 8A.

7. See, e.g., Jay P. Wagner and Perry Beeman, "Study counts manure spills," Des Moines Register, July 27, 1995. p. 1A, discussing a National Pork Producers Council study of environmental enforcement actions involving livestock production, conducted by the Drake University Agricultural Law Center, the results of which were released early in response to press demands stimulated by three large swine waste spill incidents in Iowa in the space of ten days.

8. Ronald Smothers, "Waste Spill Brings Legislative Action," New York Times, June 30, 1995, p. A8.

9. See, e.g., Anne Fitzgerald, "Public not told as manure flowed," Des Moines Register, July 22, 1995, p. 10S.

10. For a through discussion of the issues involved in the growing interstate struggle over swine production, see the series "Big Pork Moves In" written by a team of reporters, Jay P. Wagner, Dirck Steimel, and Jerry Perkins, which appeared in the Des Moines Register in May 1994. See, e.g., "A furor over big hog farms," Sunday Des Moines Register, May 22, 1994, p. 1A.

11. Thomas Urban, president of Pioneer Hi-Bred International, Inc., the world's largest supplier of hybrid seed, believes, "Production agriculture in the Western World is now entering the last phase of industrialization—the integration of each step in the food production system. The production is rapidly becoming part of an industrialized food system." From, "Agricultural Industrialization: It's Inevitable," Choices, 4th Quarter 1991, at p. 4.

12. For a discussion of the legal and social context of the issue "what is agriculture?" see Feeding Our Future: Six Philosophical Issues Shaping Agricultural Law, 72 *Nebraska Law Review* 210, 213-220 (Spring 1993).

13. John Steinbeck, The Grapes of Wrath, Limited Editions Club (1940), Vol. 1, p. viii, foreward by Joseph Henry Jackson.

14. For a discussion of the issues related to contract production, see Neil D. Hamilton, Why Own the Farm if You Can Own the Farmer (and the Crop)?: Contract Production and Intellectual Property Protections for Grain Crops. 73 *Nebraska Law Review* 48 (1994).

15. See, e.g., Gary Gunderson, "Lieske Genetics files bankruptcy," Agri News, Feb. 9, 1995, p. A1 and Paul Adams, "Lieske's bankruptcy place hog growers in tough position," Agri News, Feb. 9, 1995, p. A1, discussing the difficulties faced by several farmers who had been raising swine on contract for a company that was now unable to pay for the feed being used.

16. Minn. Stat. Ann. §§17,90-98, §514.945 (West Supp. 1994).

17. For a discussion of recent state legislative actions addressing issues related to production contracts, see Neil D. Hamilton, State Regulation of Agricultural Production Contracts, 24 *Univ. of Memphis Law Review* 1051 (Spring 1995).

18. Urban, note 10, supra at p. 5.

19. For a legal resource written to assist producers and their lawyers in considering contracting options, see Neil D. Hamilton, A Farmer's Legal Guide to Production Contracts, Farm Journal 1995.

20. For an example of an independent contractor term in a grain production contract, see a clause found in the 1993 DuPont High Oil Corn Contract. It provides

9. INDEPENDENT CONTRACTOR GROWER is for the purposes of this agreement an independent contractor and nothing contained in this agreement shall make GROWER an employee or agent of DU PONT or authorize him to act on DU PONT's behalf. GROWER shall indemnify and hold DU PONT harmless from any and all claims, in any way connected directly or indirectly with GROWER's use of herbicides and insecticides. GROWER shall carry adequate public liability and property damage insurance.

21. The recent formation of the National Contract Poultry Growers Association has been an important development influencing the legal situation for poultry growers. This development, which has been accompanied by the creation of state based grower groups, has been important in providing growers a stronger voice in dealings with contractors and in giving members the confidence and knowledge which comes from sharing common experiences with others. The NCPGA has been actively involved in promoting legislation on growers' rights and has helped introduce legislation in North Carolina, Oklahoma, Alabama, Mississippi, Florida, and Louisiana. The organization publishes a monthly newsletter, the Poultry Growers News. The creation of the NCPGA and its continued growth into an economic and political force will undoubtedly have an impact on the actions of contracting companies. For more information about the NCPGA, contact John Morrison, the Executive Director, at P.O. Box 824, Ruston, LA 71273 or call 1/800-259-8100, FAX 318/251-2981. See, Charles Johnson, "Uproar in the chicken house," Farm Journal, Feb. 1994, p. AC-1; Robert H. Brown, "Contract poultry growers begin nationwide organizing," Feedstuffs, Sept. 7, 1992, p. 3; and Steve Marberry, "Poultry growers suing contractors, organizing for clout," Feedstuffs, Jan. 18, 1993, p. 22.

22. The Agricultural Fair Practices Act (AFPA) of 1967, 7 U.S.C. §§2301 - 2305, offers some protection to growers trying to organize. Congress passed the AFPA to protect the right of farmers and ranchers to join with other growers to form associations to bargain for better prices and terms with handlers and processors. The Act sets out a number of prohibited practices for "handlers," defined to include persons engaged in "contracting ... with .. producers ... with respect to production or marketing of any agricultural product ... ." The act focuses on prohibiting handlers from discriminating against or intimidating producers because of their membership in or exercise of their right to organize associations of growers. One weakness is the law does not require a company to contract with any particular grower or grower organization; it just prohibits discriminating against them.

23. Urban, note 10, supra at p. 5.

24. In 1993, DuPont Co., traditionally known for producing agricultural chemicals, announced it was expanding into identity preserved grain production. The company constructed a 35,000 square-foot office-laboratory in Des Moines, Iowa, and opened a new division called Optimum Quality Grains (OQG) to contract with producers to raise value-added grains. In 1993, the company expected to contract with growers to plant 25,000 - 30,000 acres of grain. The most important crop being produced so far is high-oil corn, much of which is being marketed directly to poultry producers in Mexico. See Karol Wrage, "DuPont Enters the Seed and Grain Industry," Seed and Crops Industry, Dec. 1992, p. 8; Veronica Fowler, "DuPont lab set for Iowa," Des Moines Register, June 4, 1993, p. 8S; and Dale Johnson, "DuPont to start value-added grain market in Iowa," Iowa Farm Bureau Spokesman, June 12, 1993, p. 3.

25. For a review of national and international issues concerning intellectual property rights in plants and seeds, see Neil D. Hamilton, Who Owns Dinner: Evolving Legal Mechanisms for International Control and Use of Plant Genetic Resources, 28 *Tulsa J. Int'l Law* 587 (Summer 1993).

26. Id. at p. 650-651.

27. While much of the public attention to the controversy over broad-based plant patents in the United States has focused on Agracetus' claims, there have been several other decisions of importance. In early 1995, Mycogen Corporation of San Diego, California, was granted a patent (No. 5,380,831) covering the process for modifying the gene sequences in bacterial genes in *Bacillis thuringensis* (Bt) optimize insecticidal proteins in plants. See Karol Wrage, "Mycogen Issued Synthetic Bt Gene Patent: Plans to Keep Bt Corn and Cotton Rights," Biotech Reporter, February 1995, p. 1; and Teresa Riordan, "Patents: a biotechnology company uses bacteria to make crops unappetizing to certain insects," New York Times, Jan. 23, 1995, p. C2. The company reported it will license rights to the synthetic Bt method for non-strategic crops such as soybeans, rice, wheat, and vegetables; but for cotton and corn, the company plans to keep the process exclusively for its own use. The patent will no doubt prove controversial, given the amount of research already underway and the interest in the use of Bt in crop breeding for pest control. For a discussion of the possible impacts of the patent, which has already led to litigation between major seed companies, see Karol Wrage, "Mycogen Granted Synthetic Bt Gene Patent: Will This 'Lock Up' All Bt's in Crops?", Seed and Crops Industry, February 1995, pp. 14-15.

In a related development, Agracetus' European patent for genetically engineered soybeans is under attack. Both Monsanto and the Rural Advancement Foundation International (RAFI) have submitted opposition to the European Patent Office concerning its grant of a species patent for soybeans to Agracetus. The patent, #301,749 B1 was issued March 4, 1994, and covers all forms of genetically engineered soybeans. RAFI's opposition is based on its belief such broad patents to whole species of plants are a threat to world food security and morally unacceptable, as well as being technically flawed. RAFI's efforts to block the European patent are in part funded by a grant from the Jessie Smith Noyes Foundation. Monsanto's opposition to the patent is based on a view the patent is too sweeping and would adversely affect soybean research. See "Monsanto, RAFI Oppose European Soybean Patent," Biotech Reporter, December 1994, p. 1.

28. The U.S. Patent Office in early December 1994 notified Agracetus, a subsidiary of W.R. Grace, it was canceling two patents granted the company in 1992 on genetically engineered cotton. See Teresa Riordan, "U.S. Revokes Cotton Patents After Outcry From Industry," New York Times, Dec. 8, 1994, p. C1. The Agracetus patents which were for all forms of genetically engineered cotton have been very controversial since issued in 1992. Criticisms have come from groups opposed to increasing control over plant genetics, such as RAFI, from the public plant breeding sector, and from some in the seed industry. See, e.g., "Control of Cotton: The Patenting of Transgenic Cotton," RAFI Communiqué, July-August 1993. The official requests to the Patent Office to re-examine the cotton patent came from the United States Department of Agriculture's (USDA) Agricultural Research Service and from an unnamed private party. The attack on the patent is based in part on claims it was granted for existing technology, to which USDA scientists had contributed. Under the law, Agracetus has a period to respond to the Patent Office concerns. If the decision to revoke stands, Agracetus can appeal the decision within the agency and then in the Federal courts. The patent will remain valid until all of the company's appeals are exhausted. [See also, "Patent Office Reverse Decisions on Species-Wide Patent," The Gene Exchange, Vol. 5, no. 3, Dec. 1994, p. 1.]

29. 7 USC §2543.

30. 795 F. Supp. 915 (1991).

31. 982 F. 2d 486 (1992). For a discussion of the lower court opinions, see Neil D. Hamilton, "*Asgrow v. Winterboer* Case Tests Interpretation of Controversial PVPA Farmer Exemption," 9 Diversity 48 (Nos. 1&2, 1993).

32. Asgrow Seed Co. v. Winterboer, (1995 U.S. Lexis 693). The much-anticipated ruling resolves a dispute in which one of America's largest plant breeding concerns accused an Iowa farmer of illegally infringing a protected variety of soybeans by raising and selling large quantities to other farmers, a practice known as brown bagging.

In essence, the Supreme Court's ruling reached the same result as the district court, although in terms of legal analysis, the Court drove around the other side of the mile to get to the same place. The issue of statutory interpretation involved was the question of how to read the clause allowing some saved seed to be sold. Was the ability to sell seed limited by other restrictions, such as that the seed being sold had to have been legally "saved" in the first place, or was the sales exception a somewhat open-ended exemption from the PVPA's scheme to protect the rights of seed breeders and companies in their creations? The Supreme Court reached its narrow result based on a combination of what it thought was the most appropriate reading of the statute, as influenced by the Congressional purpose of enacting the PVPA to protect creators of new varieties.

The Supreme Court reached it decision on the following statutory interpretation of section 2543. First, farmers have an unlimited right to raise and sell seed for "nonreproductive purposes" free of claims of infringement. Second, the right of farmers to save seed for other purposes, such as reproduction, is limited by the requirement a variety may not be sexually multiplied "as a step in marketing" the variety of seed purposes. This limitation arises because of the incorporation of §2541(3) prohibition into the section. Conversely, the exemption which allows farmers to save seed for replanting is an exception to the restriction on "multiplying" seed for marketing. Third, it then follows that the further exception which allows farmers to sell saved seed to other farmers is limited by the prohibition of multiplying seed for the purposes of marketing it for reproduction. Fourth, this means the seed which can be legally sold for reproduction as seed to other farmers must be limited to the "saved" seed left over after a farmer has replanted the crop or as a result of a change in planting intentions. In the Court's view, to read the exemption more broadly, as done by the Court of Appeals, would mean farmers could multiply seed and save it specifically for sale as seed to other farmers. But this would be a direct violation of the statutory limitation to not reproduce seed "as a step in marketing" the seed for reproduction.

33. The seed industry had as a goal for many years reforming the farmer exemption of the PVPA. It finally succeeded in the fall of 1994 when Congress amended the PVPA to repeal the farmer sales provision of the farmer exemption. However, the amendment is only effective for new varieties certified after April 4, 1995. The amendment created a two tier system of farmer exemptions depending on when a variety was certified. The effect means Winterboer remains of great significance to the seed trade for existing varieties.

The president signed the bill in October 1994, amending the provisions of the PVPA and restricting the rights of farmers to sell saved seed [P.L. 103-349]. The bill was introduced in the Senate by Senator Robert Kerry of Nebraska as S. 1406 and as H.R. 2927 by Kika de la Garza in the House. See "Congressional Passage of New PVP Law a Triumph for Seed Industry," Diversity, Vol. 10, no. 3, 1994, pp. 34-35. The new law makes a number of changes in the Plant Variety Protection Act (PVPA) [7 U.S.C. 2321, et seq.], the primary method for breeders of sexually reproducing crops such as wheat, soybeans, and cotton to protect their rights in new varieties. The amendments include a number of amendments which will bring U.S. law into agreement with the terms of the 1991 UPOV treaty on "breeders rights." The provisions include

- incorporating into U.S. law the concept of an "essentially derived variety";
- extending the protection to 20 years and changing the law to "first to file";
- revising the term "breeder," adding a definition of variety, adding definitions concerning tubers, and amending the word "distinct." The text of the law can be found in the U.S. Congressional Record, August 12, 1994, at H8026-H8034.

34. For a discussion of the international trade agreement context of the debate over intellectual property rights law, see Hamilton, note 24, supra at pp. 610-626.

35. See, e.g., Gordon S. Carlson, "Changing farmer profile has environmental policy implications," Feedstuffs, Dec. 12, 1994, p. 4.

36. For a general discussion of the agriculture and attitudes toward environmental protection, see William P. Browne, Jerry R. Skees, Louis E. Swanson, Paul B. Thompson, and Laurian J. Unnevehr, "Stewardship Values: Still Valid for the 21st Century?" Choices, 3rd Quarter, 1992, p.20.

37. For an excellent analysis of the clash of perspectives between the agricultural and environmental communities, see Jeffrey Zinn and John Blodgett, "Commentary, Agriculture meets the environment: Communicating perspectives," Journal of Soil and Water Conservation, March-April 1994, p. 136.

38. For a discussion of the new proposed "takings" laws in an agriculture context, see Neil D. Hamilton, "Property rights, takings issue oversold to agriculture," Feedstuffs, Jan. 23, 1995, p. 14. The backlash which agriculture can expect to receive for such positions can already be seen in such things as the Environmental Working Group's report City Slickers, concerning non-farm residents who receive farm program benefits. See, e.g., Stephen Engelberg, "Farm Aid to Chicago? Miami? Study Hits an Inviting Target," New York Times, March 16, 1995, p. 1A. See also Carol Pope, "Bringing in the Sheaves," Sierra, May/June 1995 p. 14 and Paul Rauber, "Down on the Farm Bureau," Sierra, November/December 1994, p. 32.

39. The USDA, under Secretary Dan Glickman, is reportedly involved in several on-going studies concerning the potential impact of concentrated market power in the livestock sector. These studies include an examination by the Packers and Stockyards Administration (PSA) of concentration in the meatpacking industry and another PSA study of the effect of vertical integration on the swine industry. See George Anthan, "Fewer 'hands' processing food," Des Moines Sunday Register, July 23, 1995. p. J1.

40. For a discussion of the relative contributions of the different sectors of agriculture, see Stew Smith, "Farming' - It's Declining in the U.S." Choices 1st Quarter, 1992, p. 8.

41. There is some evidence this resurgence in farmer interest in cooperation is occurring, see, e.g., Randall Torgerson, "Co-op Fever: Cooperative Renaissance Blooming on Northern Plains," Farmer Cooperatives, USDA, September 1994, p. 12.

42. Such efforts are seen in the recent construction of a $12 million pasta plant by a newly formed cooperative of North Dakota durum wheat growers and the promotion of specialty and high-value crop production by a new farmer marketing cooperative in Benton County, Iowa. In Iowa, over 30 cooperative have formed the Heart of Iowa program to market member produced high-value crops for a premium. Throughout the Midwest, pork producers are forming feeder pig cooperatives to build jointly owned farrowing operations, and many are forming marketing networks to obtain price premiums from packers. See, e.g., Laura Sands, "Pastabilities: It's a High-Risk, High-Profit Gamble for Farmers Investing in the Dakota Growers Pasta Company," Top Producer, February 1993, p. A-2.

43. For example, in Iowa in recent years, there has been gradual increase in the amount of land farmed by tenants. Data from the 1992 Census of Agriculture reveal that of the 31.3 million acres of farmland in Iowa, over 16.56 million acres are rented ground while 14.78 million acres are farmed by the owner, meaning that over 52% of Iowa farmland is now operated under some form of tenancy. See 1992 Census of Agriculture, Iowa volume, Table 11, p. 317.

44. See Thomas A. Fogarty, "Farmland ownership shift looms," Des Moines Register, April 7, 1995, p. 1, which discusses a recent Iowa State University study, noting that over 61% of the farmland in Iowa is owned by individuals 61 or older.

45. For example, in 1994, the Iowa State Bar Association formally approved the use of a new standard form lease for agricultural tenancies in the state. The new lease was the result of a two-year-long project by the Agricultural Law Section of the bar and was designed in part to create a lease containing more extensive provisions to address environmental issues which can arise between tenants and landlords.

46. The concept of matching retiring farmers who do not have heirs who want to take over the farm with unrelated individuals who would like to start farming was created by the Center for Rural Affairs in Nebraska and has since been patterned in a number of states. See, e.g., Michael Lev, "Finding new blood for farms," Des Moines Register, Feb. 19, 1995 p. 3G; Thomas R. O'Donnell, "A match made in farming," Des Moines Register, May 27, 1993, p. M1; Dan Looker, "Would-be farmers meet landowners without heirs," Des Moines Register, June 16, 1991.

47. See, e.g., Report of the Minnesota Corporate Farm Law Task Force, prepared under authority of Chapter 622 section 6 of the 1994 Laws of Minnesota, Feb. 15, 1995, which includes Appendix C giving histories for anti-corporate farming laws in other states.

48. For example, under Iowa law, Section 9H.4 (1993), certain corporations may not "directly or indirectly, acquire or otherwise obtain or lease any agricultural land in this state." However, the law does not prohibit corporations which would otherwise be prohibited from acquiring land from engaging in agriculture through the use of various contract production relations. Laws in some other states, for example, Minnesota, specifically prohibit corporations from "engaging in agriculture," arguably a broader prohibition than acquiring farmland. See, e.g., Minn. Stat. Ann. §500.24. In some states, broadly worded exceptions, such as for "family farm corporations," have created anomalous situations like that found in Missouri, where Continental Grain, one of the world's largest privately held corporations, has argued, apparently sufficiently for purposes of its Missouri swine ventures.

49. For a discussion of the recent debates in states such as Missouri, Kansas, Iowa, and Oklahoma over amending existing laws limiting the agricultural involvement of corporations, see Jim Patrico, "Corporate Farming, Round Two", Top Producer, mid-Feb. 1995, p. Z-1.

50. In 1994, Kansas became the latest midwestern state to make significant changes in its corporate farming law. Kansas had been the only state other than Iowa to prohibit pork packers and processors from feeding or contracting for animals. Seaboard Corporation's decision to construct a large swine-packing facility in Guymon, Oklahoma, led Kansas lawmakers to amend the law so producers could have the opportunity to feed pigs for packers. In April 1994, Kansas enacted legislation to amend the provisions of the state's corporate farming law prohibiting meat processors and corporations from engaging in swine production. The legislation, Senate Bill No. 554, was signed by the governor, who had vetoed a version of the amendment in 1993. The 1994 law authorizes counties to allow corporate hog operations. The issue must be put to a vote of county citizens only if within 60 days of the county decision a petition protesting the decision is signed by 5% of the "qualified electors of the county" (based on number who voted in the preceding election for secretary of state). The law clears the way for corporate hog farming, either through direct ownership or the use of production contracts; and many Kansas counties have already acted to authorize such ventures. The law specifically provides that use of swine production contracts is not a violation of the corporate farming law by providing such contracts "shall not be construed to mean the ownership, acquisition, obtainment, or lease, either directly or indirectly, of any agricultural land" in the state. The law also includes a number of provisions to regulate the manner in which swine production contracts are used.

51. For a recent discussion of the issue from a North Carolina perspective, see the five-part series "The Power of Pork" written by Joby Warrick and Pat Stith, which appeared in the Raleigh Observer in February 1995, e.g., "New studies show lagoons are leaking," Feb. 19, 1995, p. 1A.

52. State regulation of pork production was a central issue in the 1995 Iowa General Assembly. After considerable debate, the legislature passed an omnibus bill, House File 519, and the governor signed it into law on May 30, 1995. The legislation establishes new minimum separation distances for certain waste handling facilities, authorizes the state to require mandatory manure management plans for waste disposal, amends the state nuisance law to provide enhanced "right to farm" protections for livestock facilities meeting state regulations, and creates an indemnity fund for the use of counties to clean up abandoned waste handling facilities.

53. See, e.g., George Anthan, "Report: Idle land is killing exports, Des Moines Register, May 30, 1994, p. 1A, discussing a report by the National Grain and Feed Foundation, affiliated with the companies comprising the commercial grain handling industry.

54. See, e.g., George Anthan, "Ag officials see 'golden era' in export trade," Des Moines Register, Feb. 19, 1995, p. A1.

55. For a recent discussion of the farm policy issues related to conservation, see Carol Kramer and Sarah Lynch, "Conservation, Environment, and the 1995 Farm Bill," ERS/USDA, Agricultural Outlook, March 1995, p. 20.

56. For a discussion of the issues involved in writing the 1995 farm bill, see Richard J. Durbin, "Commentary: The elements of a successful farm bill," Journal of Soil and Water Conservation, July-August 1994, p. 339.

57. See Neil D. Hamilton, "The value of land: Seeking property rights solutions to public environmental concern," 48 Journal of Soil and Water Conservation 280 (July/August 1993).

58. The American Farmland Trust has played an important leadership role in identifying various ways to green the farm programs. See A. Ann Sorenson, ed. Agricultural Conservation Alternatives: The Greening of the Farm Bill, American Farmland Trust, Oct. 1994. See also Ralph Heimlich, "'Green Payments' As a Policy Option," Agricultural Outlook, USDA/ERS, June 1995, p. 21.

59. Controversy over the marketing of food containing genetically engineered components led to the creation of the Pure Food Campaign to fight FDA and EPA approval of such products. For a discussion of this development, see Hamilton, note 24 supra at pp. 653-655.

60. See, e.g., Marian Burros, "Congress Moving to Revamp Rules on Food Safety: Reducing Federal Role," New York Times, July 3, 1995, p. 1.

61. One of the newest innovations posed to sweep through agriculture is the concept of "precision farming" which uses satellite-based global positioning technology integrated with field level yield data to influence the application of various agricultural inputs such as seed and fertilizer. Many agricultural companies are very excited about the technology, see, e.g., William Ryberg, "Deere invests in 3 research firms: Companies are in forefront of 'precision farming' movement," Des Moines Register, Dec. 16, 1993, p. 8S, and many farmers are excited about the idea, although the actual profitability of the technology is still uncertain, see, e.g., Joanne Welsh, Dose of Reality: Study shows prescription farming can cost more than you think," Top Producer, December 1993, p. AC-1. The whole concept of "precision farming" appears to be a classic example of an industrialized agriculture's idea of a solution. To adopt the technology, a farmer would need to purchase 4 or 5 different forms of expensive and complex inputs, including the computer and software to run the programs, the global positioning system to indicate the position of equipment in the field, monitors to develop in field level data on yield variations, and planters or other equipment which will allow site-specific modifications in application rates. All of this cost and investment would be designed to do something which many people would argue could be achieved by getting down off the tractor and walking through the field to identify variations in crop performance. But there isn't a lot of new technology which is sold for people to walk and observe field performance. No doubt, "precision farming" will be adopted by a portion of agriculture because it fits an increasingly industrialized system. Some of the reasons why it will probably be adopted, regardless of whether it makes economic sense, include the fact many producers may be farming more land than they can care for using conventional means, farmers love new gadgets, farmers want to be perceived as technologically sophisticated and this is their chance to get on the information superhighway, and many agribusinesses will have something new to sell. Those are the ingredients for a sure-fire winner.

62. For a thoughtful article concerning the important role of small farmers in the future of American agriculture from a well-respected agricultural observer, see Gene Logsdon, "Get Small Or Get Out!" The New Farmer, July/August 1994, p. 14.

63. See, e.g., Boyd Kidwell, "Vegetable Growers Get Fresh with Consumers," Progressive Farmer, July 1995, p. 24.

64. See Rich Pirog, "The Milkman Returns," Leopold Letter, Vol. 7, No. 2, Summer 1995, p. 6, concerning the increased demand for home delivery of milk products in New York City and how this exemplifies the "people/food relationship."

65. See Rod Smith, "Microfarmer, 'Clean foods' could reach 25% of consumers," Feedstuffs, July 11, 1994, p. 8, reporting a prediction by Gerald Celente, president of The Trends Institute, that by 2015, "microfarmers" catering to consumer demand for high quality food production will have captured as much as 25% of the food market.

66. Creating a national market for organic produce was part of the justification behind inclusion of the Organic Food Production Act as part of the 1990 Farm Bill. See 7 U.S.C. §6501. For a discussion of the effect and operation of the law, see Timothy J. Sullivan, "The Organic Food Production Act," 2 parts, Farmer's Legal Action Report, Summer 1994 at p. 3 and Autumn 1994 at p. 3. While the USDA is moving forward with efforts to implement national standards for the production and sale of organic food as authorized by the 1990 farm bill, the organic food industry faces internal issues concerning the ethics of food labeling and marketing. See Molly O'Neill, "A Question of Ethics Confronts Organic Food Industry," New York Times, May 17, 1995, p. B1.

67. For a discussion of the "community support agriculture" idea which uses consumer subscriptions in the produce of a local farm, see, e.g., Brian DeVore, "Sustainable Eating 101: The CSA Lesson," The Land Stewardship Letter, Jan./Feb. 1995, p. 1; Paul Rauber, "Food for Thought: Money Where Your Mouth Is," Sierra, July/August 1995, p. 16; and Thomas Brunner, "The Community Supports This Farm," Progressive Farmer, Feb. 1995, p. 48. For a book on the subject of GSA's, see Trauger M. Groh and Steven S.H. McFadden, Farms of Tommorow: Community Supported Farms. Farm Supported Communities, 1990.

68. See, e.g., Peggy Knickerbocker, "Farming for the Love of Food," Saveur, No. 7, July-Aug. 1995, p. 60, concerning the food production system being established in the Tomales Bay region of California.

69. The issue of how the nation's food system relates both to personal health and the health of the environment, as well as our form of society, has become a more common subject in the nation's press. For example, the November/December 1994 issue of Sierra, the magazine of the Sierra Club, was titled "The Plant on Your Plate: Saving the Earth Three Times a Day," and featured a series of articles about the role of food and agriculture policy, including an article by Paul Rauber, "Conservation a la Carte," at p. 42, which featured American chefs who cook by nature's rules.

70. For a valuable book which explores many of the issues involved in the relationship among farming, agriculture, and food consumption, see Robert Clark, ed., Our Sustainable Table, North Point Press, 1990.

71. Part of the "New Agriculture" concerns the focus of producers and communities on building strong "community food systems" which consider the full range of economic and social issues relating to food production and marketing, including issues of hunger and food availability. For a discussion of the recent efforts of such individuals to organize and to introduce legislation for inclusion of the "community food security" concept in the 1995 farm bill debate, see "New Coalition Proposes to Recast Farm Policy Around Community Food Security," Nutrition Week, Jan. 27, 1995, p. 1 and "Food Security Act Would Support Local Initiatives," Nutrition Week, April 28, 1995, p. 4.

72. The issue of preserving the pieces that make up our agricultural heritage is another important part of the new agriculture. The recognition of the importance of preserving the history of agriculture and using it to educate today's society about our food system can be seen in the work of such diverse groups as the Seed Savers Exchange in Decorah, Iowa, which works to preserve heirloom varieties of fruits and vegetables; the American Livestock Breeds Conservancy in Pittsboro, North Carolina, which does similar preservation work with farm animals, and such living agricultural museums as Living History Farms in Des Moines, Iowa and the Museum of American Frontier Culture in Staunton, Virginia. Two recently published books eloquently reflect the human dimension in the appreciation of our agricultural heritage. See John Hildeband, Mapping the Farm: The Chronicle of a Family, Knopf 1995, and David Mas Masumoto, Epitaph for a Peach: Four Seasons on My Family Farm, Harper, San Francisco, 1995.

73. Another component of the "New Agriculture" concerns the role of chefs in educating consumers about food choices and creating markets for locally produced foods. In 1993, a group of the top chefs in America organized an initiative called "Chefs Collaborative 2000" to advance "sustainable food choices for the next century." See, e.g., Julie Mautner, "Culinary Camp-out: A growing group of chefs sets out to change the way Americans eat," Food Arts, October 1994, p. 53. The Chefs Collaborative, now with hundreds of members, has established the following Charter and Statement of Principles, to guide their actions:

Charter Preamble—We, the undersigned, acknowledging our leadership in the celebration of the pleasures of food, and recognizing the impact of food choices on our collective personal health, on the vitality of cultures and on the integrity of the global environment, affirm the following principles...

Statement of Principles

1. Food is fundamental to life. It nourishes us in body and soul, and the sharing of food immeasurably enriches our sense of community.
2. Good, safe, wholesome food is a basic human right.
3. Society has the obligation to make good, pure food affordable and accessible to all.
4. Good food begins with unpolluted air, land and water, environmentally sustainable farming and fishing, and humane animal husbandry.
5. Sound food choices emphasize locally grown, seasonably fresh and whole or minimally processed ingredients.
6. Cultural and biological diversity is essential for the health of the planet and its inhabitants. Preserving and revitalizing sustainable food and agricultural traditions strengthen that diversity.
7. The healthy, traditional diets of many cultures offer abundant evidence that fruits, vegetables, beans, breads and grains are the foundation of good diets.
8. As part of their education, our children deserve to be taught basic cooking skills and to learn the impact of their food choices on themselves, on their culture, and on their environment.

74. See, e.g., Kenneth Pins, "ADM flap may hurt ethanol," Des Moines Register, July 27, 1995, p. 7A.

75. Thomas Jefferson is considered by most historians to the principle architect of the American agrarian system. For a concise collection of Jefferson's writings on agriculture, see the chapter "Thomas Jefferson, Agrarian," in Wayne D. Rasmussen, ed., Agriculture in the United States: A Documentary History, Volume One, pp. 294-306, (1975). For an excellent biography of Jefferson by the undisputed dean of Jefferson scholars, see Merrill D. Peterson, Thomas Jefferson and the New Nation: A Biography, (1970). A study of Jefferson's writings on agriculture reveals the following tenets concerning the structure and operation of American agriculture he visioned:

- broad distribution of agricultural land ownership;
- open opportunities for people to enter agriculture;
- a diversified food production system at the national and enterprise level;
- agriculture as one of the main sectors of the economy, but in balance with commerce and manufacturing;
- a recognition of conservation and innovation in agriculture, e.g., crop rotation;
- agriculture as an outlet or expression of man's relation with nature;
- a reliance on new technologies, such as machines and seeds, which would increase production; and
- the goal of improvement of agriculture for human welfare.

Perhaps Jefferson's most famous quote about agriculture is, "Those who labor in the earth are the chosen people of God, if he had a chosen people, whose breasts he has made his peculiar deposit for substantial and genuine virtue." See Peterson, supra at p. 256. For a more contemporary discussion of the current vitality of Jefferson's agriculture, see Douglas L. Wilson, "The Fate of Jefferson's Farmer," North Dakota Quarterly, Fall 1988, p. 23. For a somewhat less enchanted perspective of American agrarianism, but a thought-provoking article, see Jim Chen, Of Agriculture's First Disobedience and its Fruit, 48 *Vanderbilt L. Rev* (1995).

76. See Ann Fitzgerald, "Extension at a crossroads," Des Moines Sunday Register, June 25, 1995, p. 3G.

77. Bruce Bohle, The Apollo Book of American Quotations, 1967, p. 154.

Consequences of Industrialization on Public Policy Issues and Industry Practices

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There is a common activity happening right now in food businesses; these are activities you have just heard cited by Professor Hamilton as well as key themes which we have heard at this conference, including 'integration, food safety, quality, information as power, and controlling commitments with selected sources of supply'.

My company, which operates in Canada, the United States and Venezuela, and by one tally is the 26th largest food company in this hemisphere, is actively engaged in milling wheat, corn, oats, and rice, animal feed and bakery mix manufacturing and vegetable processing, including pickles and relishes.

Considering my background, then, the points that Prof. Hamilton raises that particularly strike a chord with me are first, let's address prospects for contract production and genetic engineering. I see this at work as manufacturers who use flour as an ingredient place more and more demands for functional attributes on the flour miller, who has in turn placed more and more demands on wheat origination elevators, who have placed greater demands on producers for change in varieties and even harvesting practices.

Second, increased co-operative development is another macro-trend that we have witnessed, as indeed there has been a good amount of success by producers in North Dakota, Minnesota, and surrounding states with co-operative marketing initiatives. They (these newly formed co-ops) are companies that I deal with today as suppliers, and they are good business organizations and valuable components of my supply base.

And, of course, there is the impact on farm policy that large food companies such as mine at least seek to have. Our experience at Multifoods certainly do point to the conclusions set forth by Prof. Hamilton.

I am familiar with the wave of demands that have been placed on food ingredient suppliers, especially in the last 10 to 12 years. It does appear that our roles among us all, as industry participants, are becoming more 'blurred'. And, I'm beginning to see evidence that those demands are moving further back in the pipeline, even to the farm field. That common activity I suggested a few moments ago is to control or at least heavily influence every step of the process that brings food from the farm field to consumer's table. And, there is interesting interplay between those desiring to control the process.

Through our experience, I see a very common effort to exert influence over other

stakeholders in the pipeline. How these influences are affecting processors of agricultural commodities via my company's activities will be the primary example I'll share with you today.

Purchasing strategies have evolved over the past several decades. We have witnessed buyers' unyielding focus on "price" in the 1950s altered by the introduction of new technology in the 1960s. The 1970s was dominated by an awareness that high quality reduces costs. In the late 1980s, and even today, purchasing focuses on "service" such as on-time arrival of goods, speed of responsiveness, marketing trend insights, market price trajectory forecasts, and accessibility to decision makers within the suppliers' organization.

The economic reality still is that buyers will buy the lowest cost goods. What has changed, however, is the definition of cost. Price no longer equals cost; instead, price + technology + quality + service = cost.

At my division of Multifoods, we often challenge each other to view issues from others' perspectives. This is because needs may vary by stakeholder. Manufacturing may be driven by the need for high quality goods to reduce waste; sales may need goods with advanced technology to connote points of difference in order to facilitate the selling process; or finance may be driven simply by low price and apparent savings. Further, needs vary from product to product and do change over time. Even more important are the needs as defined by the company's customers or the customer's customers. The real key is to determine these stakeholders' needs and match them, as best possible, to one another, simultaneously.

Let's move beyond concept to an example of how this thinking is being employed today. For 10 years now, a systematic, quantitative supplier analysis has been used successfully at Pillsbury. It has had the effect of pushing volume to those suppliers best matching the company's needs. The process begins with a document with 10 questions which fit squarely into the areas of price, technology, quality, and service. Input is received from numerous sources, including marketing research and development, operations, quality assurance, and, of course, purchasing. Pillsbury's supply base has decreased by 40 percent in recent years, and those suppliers who have matched both internal and external customer needs have realized the benefit of increased sales volume.

In my division of Multifoods, we have graphed these needs so that we have a graphical reference as to a supplier's competencies compared to the stakeholder's needs in that area. Is this a breakthrough approach? No, but, for us, it has broken through the clutter of purchasing strategies and helped us to focus on the basics of supplier performance and our customers’ needs. Is it systematic? Yes, and it has given us a methodical way to assess customer needs against supplier competencies. The future most likely will prove that there are still other stakeholders to satisfy and other needs for buyers to identify.

Industrialization is not a threat to agriculture; it is an opportunity to work harmoniously with other parts of the food pipeline to assure a better total food system. This conference is one step in the right direction; let's find other ways to facilitate the dialogue between us all.

Chapter 6

Agricultural Technology in the 21st Century

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and Board Member, USDA AARC

It is a pleasure to meet with you and to speak with you about agricultural technology in the 21st century as part of this timely meeting on industrialization of Heartland agriculture. Technology will be a major driver in both shaping the opportunities and the outcomes.

I find change exciting. Change produces many opportunities, and we should educate our children about the fun and excitement of change. We need to communicate the message that change produces great opportunities. We need to provide children with factual reading material about the opportunities that change brings. The overall quality of life will be better for those who take advantage of the opportunities resulting from change rather than those who resist change. Technology has, does, and will cause change.

I will begin by sharing with you a recent dream about change in which 21st-century agricultural technology was generated by futuristic and appropriate policy and produced a highly optimistic outcome for society, the environment, national security, economics, rural development, farm economy, sustainability, and human health.

The futuristic and appropriate federal government policy initiated research, development, and commercialization (RD&C) investment in our carbon economy starting in 1995 using one percent of the military costs now spent to assure foreign petroleum access. One percent is about a billion dollars a year with a commitment to increase the amount stepwise to five percent by 2015, or five billion dollars, to become self-sufficient by 2025 and repayment to the government as the United States becomes carbon self-sufficient with no more need for imported petroleum. The evolving technology produced by this RD&C initiative placed the United States on the road to energy self-sufficiency, matching our already long-established food self-sufficiency. Driven by this RD&C initiative, rural development growth is exceeding urban development. Our food is more nutritious and safe, a need we heard about this afternoon. Production and processing with new technology are more environmentally friendly, something else we heard about today. Atmospheric carbon dioxide growth is slowed without the need for large gasoline taxes. The threat of global climate change has diminished. The Japanese are disadvantaged because they cannot duplicate this energy self-sufficiency; they lack arable land, and that is the key resource. The carbon economy has become more sustainable, and the established energy and chemical companies are losing market shares to the new wave of biobased versus fossil-based companies.

As the dream indicated, I want to talk about the carbon economy and technology. What are the sources of carbon? The ultimate source of carbon is photosynthesis in which green plants take carbon dioxide and solar energy to produce plant biomass. The carbon economy can be divided into two parts: one is biobased; the other is fossil based. The biobased part results from current photosynthesis; it is the green plants and trees that are continuously regenerated. It is a huge activity with 150 to 170 billion tons of new photosynthate produced per year globally. That is about 30 tons

of photosynthate produced per year per person in the world or a huge amount of biobased carbon for each of the five or six billion people on earth. The fossil-based part is based on previous photosynthesis; it is not regenerated, but in the 20th century has become the dominant source of carbon used by the carbon economy.

What is the contribution of the carbon economy to our gross domestic product? It is 17 percent of our gross domestic product (GDP), 51 percent of our manufacturing GDP, 100 percent of our nondurable manufacturing GDP, 70 percent of transportation and utility GDP, and obviously, as you are well aware, 100 percent of the agricultural food and forestry GDP.

We should make our carbon-based economy biobased rather than fossil based. We need to do that from a national security point of view. We spend nearly 100 billion dollars a year on our military to assure access to foreign oil. The Gulf War is a clear indication of the importance the United States places on access to foreign oil.

Biobased carbon is relevant to economics and competitiveness. Imported petroleum has a major negative impact on our balance of payments; we are paying a lot for foreign petroleum. Biobased carbon would represent new markets for agriculture and forestry. Biobased carbon represents the opportunity to use our excess arable land that is not needed for food production. Biobased carbon provides opportunities for rural development. Biobased carbon could eliminate the need for crop subsidies. Fossil-based carbon is inherently nonsustainable, while biobased is sustainable. Biobased carbon has beneficial health impacts, including cleaner air, water, and soil, while fossil-based generates harmful residues from petroleum processing plants and from the combustion of petroleum in automobiles and other transportation vehicles. There is a much lower rate of net carbon dioxide released into the atmosphere by biobased carbon versus fossil based. These are some of the advantageous impacts of biobased carbon.

It would have been unrealistic to have suggested energy self-sufficiency 20 years ago. We did not have the technological capability. Biological sciences are at the center of technology today. We are in a constant stage of discovery in the biological sciences. You have only to read the newspapers to hear about the discovery of a significant new gene such as, for example, the recent discovery of a gene associated with Alzheimer's disease. Biological sciences are where the inventions are occurring. Physical sciences served us well in the first half of this century, but they are now mature with few new major discoveries. I spent more than 20 years at DuPont, from the 1960s to the 1980s, and it became clear to us in the 1970s that the chemical sciences did not offer DuPont the opportunity for new discoveries, new inventions, or new products as they offered in the 1930s, 1940s, and 1950s.

We are now generating laws of biology that are every bit as rigorous and fundamental as the laws of the physical sciences. The law of $E=mc^2$ discovered by Einstein is a major physical science law. We now have equally key and equally rigorous laws in biology. Law 1: DNA, or in a few cases, RNA, is the source of all genetic information for all living organisms. Law 2: DNA is self-replicating, whether it is from bacteria, humans, or plants. Law 3: DNA, which I like to refer to as top management molecules, can direct the formation of RNA, which I refer to as middle management molecules which, in turn, can direct the formation of proteins which I refer to as worker molecules. If you know the structure of DNA, you can write the structure of RNA or the protein whose formation it will direct. You can view the relationship of DNA to RNA to protein as an ideal line

management organization in which the workers do exactly as directed by top management and communicated by middle management.

The proteins that are formed, the worker molecules, are formed in a linear array but fold into three dimensions for their function. We biologists are in the process of learning the laws of protein folding. We are also in the process of learning how to predict function from the three-dimensional confirmation of these proteins. We will get to the stage, in fact, where I think we can identify a desired function and theoretically design the DNA to produce that protein. We will become highly theoretical; we can become design oriented, and we will have a high probability of delivering what we want from a given design.

Not only have laws of biological technology developed, but the information base is exploding. Initiatives like that of human and other genome mapping and sequencing efforts are generating a huge information base. Biologists have developed a set of tools. These laws, the information base, and the tools enable biology to become theoretical, predictive, and design oriented in contrast with the old biology which was a random cut-and-try approach. For example, plant breeding is based on a major sorting of plants generated by crosses to find the one in hundreds or thousands with the sought-for advantage. In the new biology, you identify what you want, you make it, and you have a high probability that it is going to do what, in fact, you wanted it to do.

The new biology or biotechnology requires major front-end investment to produce these designed products or processes. There must be an opportunity to obtain a reward commensurate with the risk that is being taken in generating those improved materials. Patents or their equivalent are essential to encourage this front-end investment. These higher value products and processes will encourage integration from the grower and input industry to the processor and distributor to capture the value of what has been described as identity-preserved materials. It is not clear who will be the dominant party in identity-preserved crops. The distributor and processor have the customers, while the input industry has the technology and growers have the arable land.

The initial examples of this new biotechnology are being commercialized. We are very early in the process. I have summarized the current status in an article prepared in 1994 for Contemporary Nutrition (v.19 (2):1-2) which was distributed to physicians and dieticians and in the 1994 National Agricultural Biotechnology Council Report, Agricultural Biotechnology and the Public Good (NABC 6:43-58).

I will list a few examples of commercial products from this new technology. About 15 years ago, this new technology enabled production of human insulin in bacteria and allowed people for the first time to have human insulin as opposed to using a similar, but not identical, material from pigs. The first commercial product in the food area was chymosin for cheese making, made by microorganisms. It was approved and first marketed in 1995 with five years of successful use. Microbial chymosin allowed replacement of renin obtained from slaughtered calf stomachs, a relatively impure and relatively unreliable source. Over 60 percent of the cheese made today uses a transgenic product chymosin in which genes have been moved from an animal to a bacteria to make a highly pure product. Transgenic chymosin is now approved as kosher, vegetarian, and halal. The process used to make microbial chymosin is the same as that used to produce transgenic BST in microorganisms for improved milk production efficiency. There is no debate about chymosin, while

there is much about BST. The issue for BST is an economic one and not one of a process of manufacture or human safety.

The new technology is able to provide foods with preferred consumer characteristics such as the improved flavor of the Flavr Savr™ tomato. We are able to make plants self-resistant to insects and self-tolerant to diseases, and such examples are coming to the market place. The Asgrow viral-resistant squash is an early one that has been approved for use. A bacterial toxin for insects called Bacillus thuringiensis toxin is being produced by transgenic corn, cotton, and potatoes to protect the crops from pest insects, and these crops have received initial approvals for commercial use.

A more futuristic product will be plants that are nitrogen self-sufficient; such plants will require no added fertilizer nitrogen. Crop agriculture requires huge amounts of nitrogen fertilizer, over 80 million tons in 1990 or over 20 times that used in 1950. This nitrogen fertilizer costs $20-$60 billion a year worldwide. If we were to invest in this area, it is probable that we would have transgenic crops, corn, wheat, rice, that are nitrogen self-sufficient and no longer require fertilizer nitrogen. Such a technical advance would have great environmental impact and relevance to sustainability. It is not feasible to think of using synthetic nitrogen fertilizer in sustainable agriculture, but nitrogen self-sufficient plants would be sustainable. The cost saving to crop production would be huge.

Another future impact of technology is the production of energy, chemicals, and materials from plants. In my view, the future nylons, utilizing the word "nylons" to refer to man-made polymers, will be produced by clean green plants growing in farmers' fields and utilizing carbon dioxide, water, and solar energy with no need for petroleum. There is the opportunity for greater design flexibility in plant-protein polymers than in synthetic chemical polymers. Plants use 20 or more monomers with different functional groups, while most synthetic chemical polymers use only two monomers. Plants provide us the opportunity to design and make polymers with greatly enhanced performance capabilities relative to synthetic chemical polymers.

Finally, I want to focus on carbon self-sufficiency. The U.S. inventory of carbon is, in part, biobased and, in major part, fossil based. We consume between 2.7 and 2.9 billion tons of carbon annually. The big area is fuel or energy that uses 1.5 to 1.8 billion tons or about 60 percent of the total. Ninety-five percent of our fuel is fossil based, and about 5 percent is biobased. Fuel is a major opportunity for agriculture.

Food and feed are about 400 million tons a year, or about 14 percent of our carbon budget. Materials, such as lumber, pulp and papers, and natural polymers are about 300 million tons a year, or about 11 percent of our total carbon budget. Materials are predominately biobased with 10 percent fossil and 90 percent biobased. Synthetic polymers like the nylons are the main materials that are not biobased. Chemicals, such as monomers used to make polymers, etc., are about 100 million tons a year, or 3 percent. Chemicals are about 90 percent fossil based and about 10 percent biobased.

The challenge is to eliminate the need for foreign fossil-based carbon, eliminate all petroleum inputs. That could be done if we developed and commercialized technology to convert our fuel source to about 65 percent fossil, 25 percent biobased; chemicals to a 50/50 mix; and materials to 5 percent fossil and 95 percent biobased. For fuel, I propose the conversion of biomass to

economic ethanol. I am not talking about corn starch to ethanol, which is not an economic process as it requires substantial subsidization. Corn-starch ethanol is only about 1.5 percent of our liquid fuel and is not a long-term solution. We need a cheaper source of biomass. Corn was designed as food and feed and was not designed to make ethanol. We should design the biomass crop with new technology to fit the end use of energy. We also need to improve the process to effectively convert cellulose and hemicellulose to ethanol. The National Renewable Energy Laboratory within the Department of Energy is genetically engineering organisms to make the optimum mix of enzymes to convert cellulose and hemicellulose to their monomers. Within the last year, it has reported the development of a transgenic organism that effectively converts both five-carbon and six-carbon sugars to ethanol. The goal is to produce 67-cents-a-gallon ethanol which, in fact, would be economically competitive with gasoline. Ten tons of biomass per acre per year would yield a thousand gallons of ethanol. With 100 million acres, one could produce 100 billion gallons of ethanol and exceed our goal of energy self-sufficiency with no need to import petroleum.

In the chemical area, ethylene is the major building block and can be produced from ethanol by removing of a molecule of water. With 67-cents-a-gallon ethanol, you can produce about 20-cents-per-pound ethylene which would be competitive with petroleum-produced ethylene. In addition, there are other chemicals that could be made from biobased carbon.

The synthetic polymer component of materials is an opportunity for biobased carbon. A polyester called Biopol™ is produced by microorganisms and sold by Zeneca for high value uses. It is costly to produce, and transgenic plants are being developed to produce the polyester at lower cost. Another company is developing transgenic cotton to make both polyester and cotton so that, in fact, the cotton plant produces a wash-and-wear blend. Some plants naturally produce fibers that appear to have substantial value. The floss of milkweed or Syriaca may be such an example. Natural Fibers in Nebraska is domesticating milkweed, developing processing equipment, and manufacturing comforters utilizing the floss. This company visualizes additional markets for the floss as yarns, nonwovens, and paper products. The nonwovens would replace fossil-based carbon. If all of these uses should be realized for milkweed floss, up to about 100 million acres of milkweed would be produced, a major agricultural opportunity based on industrial uses of a single new crop.

Last, I will comment on food and feed. The opportunities for new markets for agriculture are not as great as the opportunities for industrial uses. The food market is almost a static one with new food products displacing existing ones. There are opportunities to make our food more nutritious and safer. For example, we can modify plant lipid compositions for improved cardiovascular nutrition. We can modify plants to reduce toxicants and increase antitoxicants that might reduce cancer. About 60-70 percent of the causes of cancer are not identified. I would not be surprised to see the toxicant chemicals that exist in our natural foods as a major cause of some of this 60-70 percent. New technology allows us to reduce or eliminate these toxicants and increase the antitoxicants in plants. Broccoli was mentioned earlier today as an example of a plant that is beneficial in reducing incidence of cancer.

Microbial contaminants are a major problem in food. DNA probes developed by the new technology are highly sensitive in identifying microbial contaminants. Many of us have allergies to food. Genetic engineering could produce plants and other foods in which the protein allergens are removed.

Technology is at the stage where there are going to be dramatic changes, not just in our food system, but in our whole ability to utilize biobased carbon to make fuel, chemicals, and materials. These changes will generate major new opportunities for agriculture and related processing and distribution companies. The challenge is to look beyond the food area to the bigger opportunities in the nonfood, industrial-products area.

In conclusion, if we made a major investment in research, development, and commercialization, all three, you cannot just do the R&D without doing the commercialization, then our carbon-based economy could become self-sufficient by about 2025 with major attendant benefits. National security would be enhanced with the potential for a reduction in military expenditures. There would be major beneficial economic impacts to agriculture and forestry and rural economics. There would be beneficial health effects. There would be environ-mentally beneficial effects because biobased carbon will slow atmospheric carbon dioxide increases. Sustainability would be increased. This biobased opportunity is almost unique to the United States since we have the key resource of arable land.

Chapter 7

Reactor Panels Consider Consequences of Industrialization
Panel One — Production Agriculture
A Broiler Farmer's Perspective

Dan Smalley
Poultry Producer, Gunthersville, Alabama

There are many things that we do very well in this country, despite what you read and hear about the declining efficiency of our industries and the falling quality of goods produced. One thing we do well is grow chickens. If General Motors had been as efficient as the poultry industry, you could buy a Cadillac today for less than $5000!

What is the secret to this success, referred to by some as the greatest business success story of the last 50 years?

First of all, let me give you a little history of the evolution of the broiler industry.

In the thirties and forties, most farm supply stores not only sold feed, seed, and fertilizer, but also would order baby chicks for their farm customers. At first, it was a small sideline for both the stores and the farmers. However, in less than 20 years, broiler production became a major enterprise employing specialized, large-scale farming operations. It was a period which saw rapid change and growth, attended by some spectacular financial gains and losses for many of the early industry leaders.

Farmers were at extreme risk when they had to buy feed, chicks, and supplies and try to sell at a profit. Also, companies (mostly feed companies, but also hatcheries) could not utilize their facilities with a fluctuating market for their products.

In the 1930s, feed manufactures recognized that chicken production was a huge new market for their products. Direct sales to farmers were initiated. Farmers who had previously ordered baby chicks by mail were soon served by salesmen representing large-volume hatcheries which were built in areas of large production. Demand for food during World War II further stimulated consumption and introduced the earliest large-volume processing plants.

A disadvantage to this system was its inefficiency. Each sector of the chicken industry aggressively promoted itself without regard to the other components in the industry. Hatchery owners were only interested in selling baby chicks. Feed companies encouraged farmers to increase the size of their flocks, regardless of demand, to increase feed sales. Truckers, brokers, and others who purchased mature chickens and sold them to restaurants, hotels, and retailers needed steady supplies and survived on their ability to buy low and sell high with rapid turnover and on the longest possible credit terms. Companies which processed chickens were squeezed between their supply sources and consumers. It was a fertile era for all sorts of overly aggressive practices, leading to repeated boom-and-bust cycles.

This left many farmers in financial ruin. They had no control over the price of their inputs or over the demand or price of their finished product.

Bringing order and efficiency to these chaotic operations was an opportunity identified by early industry leaders. The high risks and periodic losses of the 1950s and early 1960s resulted in consolidation of the industry.

Vertical integration came about because of the need for central marketing and more control of the supply. Many technical advances occurred during this time, including better control of major diseases, genetic improvements, nutrition breakthroughs, bulk feed delivery, and many new types of equipment for industry and the farms. Farmers were attracted to an industry where the financial risks were spread among several groups, leaving them with more assurance of success. Money-lending agencies soon found that broiler farms were a good investment and money was relatively easy to secure.

A typical poultry complex assembles the following functions: hatchery, feed mill, catching, transportation, processing plant operation, sales, and product distribution into a single management structure. In addition to these company-owned functions, there are the following farmer-owned and operated facilities: pullet production, hatching egg production, and broiler growout operations. This has enabled the industry to better control each step in the process of providing chicken in whatever form a particular customer orders.

According to one history of the poultry industry, contract broiler production was first recorded in 1933 in Virginia. As often happened, a farmer sold his flock for less than enough to pay his feed bill. To recover his accounts receivable and reduce future risk, the feed supplier offered the farmer a contract calling for equal sharing of profit from the next flock. From that beginning emerged today's contract which assures a grower a specific rate of pay for each live pound of chicken delivered to the processing plant. Growers who exceed the average efficiency for all flocks gathered in that week may earn a bonus, and those with higher production costs are paid less than the average pay. Competitive pressures govern the basic contract payment rate and the efficiency bonus.

It is the grower's responsibility to provide housing for the chicks, equipment, adequate water, electricity, energy for heat, bedding, labor, and management. The grower must also properly dispose of on-farm mortality. Companies contract with farmers who are located within about 30 miles of the feed mill or processing plant. Normally, the grower and his family live on the farm where the houses are situated, providing someone to monitor the birds and their environment.

Company-trained servicemen are the companies' direct link with the contract growers. They visit each farmer assigned to their territory at least once a week to help with problems, monitor disease, and supervise the growout.

A typical house measures 40 by 500 feet and has a capacity of about 25,000 mature broilers. Two houses are usually considered the minimum economic unit with many growers with four to eight houses and some with as many as 16. The current cost of a new house and equipment is about $110,000 to $125,000. Most growers finance the houses for ten years. During that time, the typical grower derives only a small amount of net cash income over operating costs and debt retirement.

Virtually all growers start out with at least two houses and have other sources of primary income. Young husband-and-wife teams frequently rely on income from off-farm employment until they pay off the debts on their broiler houses. Many grow beef cattle, using litter from their broiler houses as pasture fertilizer and cattle feed. Few start out as full-time farmers without other income sources.

It should be emphasized that poultry production is an enterprise which will result in steady accumulation of equity in the farming operation, but the contract grower should not expect to live on the broiler income alone in the beginning.

The biggest problems in the poultry industry are a result of poor understanding of the process of vertical integration. We farmers are a pretty independent lot. However, if someone else furnishes the chickens, feed, and medications, assumes all the responsibility of marketing the product, and bears 100% of the market risk for both the feed and the finished product, then we should expect to surrender some of our independence.

In Alabama, the nation's third leading broiler producer, 54% of all agricultural income comes from poultry. This represents a $7.5 billion impact on our economy or 10 percent of the state's total economy. This is no accident.

The industrialization of the poultry industry did not occur as the result of large conglomerates conspiring to take over the industry, but rather as an economic move by both the farmers and the companies. It has to be good for both or it is good for neither, and I feel that if you will ask virtually any poultry producer what is the most dependable and profitable enterprise on their farm, they will reply "poultry production." Many farms in the Southeast have been saved by broilers, and many farm children have received a college education because of broilers.

Change is inevitable. America lost many industries, automobile, electronics, steel, because we wanted to continue to do things as we had always done them without recognizing economic realities. Do we want to add animal agriculture to this list?

Reactor Panels Consider Consequences of Industrialization
Panel One — Production Agriculture

Jay Armstrong
Crop Farmer, Muscotah, Kansas

I would like to thank the sponsors of this conference on what I believe to be a very timely and most provocative subject as agriculture begins to ask the question, "who or what will shape its structure in the future"? I think John Madson said it best to those of us in the Heartland when he said, "Regional character is a reflection of land, and the prairie region mirrors a solid level-to-slightly rolling conservatism that may rarely produce change but usually fuels it."

As a farmer, that pretty well says it for me. Change is something I adapt to, not necessarily initiate. But putting that aside, the industrialization of agriculture in the grain sector will largely depend on government's role in agriculture. Because that role is largely a political question, I will leave that issue up to the next and future elections.

I will say this about farm programs. They have worked, especially since 1985. I am convinced the government has done a good job of managing supply to demand which has been good for all in the food chain. The government program has provided stability and a safety net for those who process and produce food.

Since we are familiar with how the farm program works and the effects it's had on farmers, I will not spend time on identifying the challenges, opportunities, and consequences of an agriculture under that scenario.

What I would like to do is to identify those same characteristics where more farmers are producing for a market (whatever that means) than are signed up in a government program.

So, before we can identify those characteristics, we must first set the demographics. If conventional wisdom is correct that the next decade, 10 percent of the farmers will be producing 90 percent of the food, I would approximate that figure into 150,000 farmers. They will be producing all the different major commodities and food categories as well as many new ones; and by that, I am thinking of non-food use crops. I don't know what percentage of that 150,000 will be feed grain producers or, for that matter, vegetable and fruit growers, but I will stick my neck out and say that whatever those percentages are, they will be a manageable group of producers. I think that is important to keep in mind.

In 1973, at Kansas State University, I took a class in agricultural policy that was taught by an overly confident, cigar-smoking professor named Flinchbaugh. He asked the class "Who would control agriculture in the future?" After much debate, he replied, "Whoever controls the market controls agriculture." Well, the future has arrived, and he was probably right. Though the answer may still be technically correct, the dynamics will change.

In 1973, there were more farmers than markets for his product. Down the road, with bio-technology, non-food uses, and new crops adding to the myriad of new products, there will be many markets looking for farmers. The problems for years has always been too many farmers, not that there has been too much land. But when we get down to 150,000 farmers producing the food for this country and export, management will bring them a good return on their time. The industrialized farmer will first of all make a profit; and second, this is most important, he will do it with somebody else taking most of the risk.

So what challenges will the industrialized farmer and those producing for a more traditional farm market face?

The industrialized farmer during this transitional period will know and use two things that work in all businesses, but unfortunately few farmers realize. And those two things are positioning and timing. Many hard-working farmers will try to contract high value products only to be disappointed and most likely displaced from farming because they forgot about positioning and timing. I have watched some of my neighbors try edible beans shipped to Japan and produce high-oil corn, only to find out that if they would have produced the current hybrids for the standard markets for that year they would have been further ahead. Farmers who lock themselves into a product or a crop will live and die with the market. Very few will be lucky in the beginning. The industrialization farmer will always make sure that he never gets so locked into one product that he does not have an alternative. He will keep his management for sale to the highest bidder, but never so much that he doesn't have control of it. I call that positioning.

His other challenge will be to control many acres of land. His ability to get land will depend upon his sales ability to market his management. His management must have a good sense of timing.

A further challenge will be his ability to withstand the waves of volatility. Today, the farm program provides a good stable safety net for all those who qualify for it. If political urban budget cutters get their way by limiting or even eliminating farm programs to where farmers "farm the market," volatility and instability suddenly become two very important factors to contend with.

They will find that they have a great amount of purchasing power as a group. I look for many groups, sort of coops with membership by invitation only, who will contract out many of their needs. He will be negotiating more marketing contracts and spending more time in procuring his needed goods and services to be a low-cost producer. He will never be fully removed from his operations because of his need to know what to procure.

His biggest challenge will be a dwindling supply of skilled farm laborers who have an inborn knowledge of the most efficient way to farm a field.

The consequences in all of this will be a more easily regulated agriculture. Concentration of an industry always makes it easier to regulate which usually begets more regulations, but an industrialized farmer will be able to pass on more of his costs than today’s farmer.

Because of his position, more will be asked of him from his community. It will be in the industrialized farmer's interest to play a large part in keeping his community’s quality of life at a level to insure a labor supply to meet his production needs. The people who work in cities will find that

their increasing incomes will allow them to move to the country, and we are seeing this today. This will create some new zoning-type problems for farmers as those who now want to move and live around farming operations probably will not understand what it takes to make a profit off the land.

In the time remaining, I would like to list some things that will have consequences as we move to a more integrated food chain.

Number 1: Farmers are not all alike. A cattleman will not be a poultry grower, who will not be a grain farmer, etc. For agribusiness to assume that what has worked in one sector of agricultural restructuring will work in another is a mistake that will create political and social tensions and slow the growth of that particular sector.

Number 2: Agricultural industry groups such as NARA and NGFD Associations, who today becry the farm program, will only long for the days when we had a farm program.

Number 3: Food is going to cost more. We probably won't see that one on any future contracts with America.

Number 4: There will be new roles for land grant institutions and especially extension. I have always been a champion of extension and the role that land grant institutions have played. Extension must change just as farmers must change, or it will be viewed as antiquated. It should start now redefining its role and mission and, because of the political climate, should do it on a national basis, not on a state-by-state assignment.

Number 5: One of the first telltale signs of how quickly contracting will increase will be whether farmers will agree about whether to fund research on their own. This is going to be an important indicator for those land grant universities and their role. As long as technology and advancements are made open to all producers, this will keep a level playing field, which gives them a chance at competitive markets.

Number 6: This is one that farmers are particularly going to have to realize. And it is something that we all say, but don't truly understand its effects, with the exception of multi-national companies. And that is we live in a global economy. Currency relationship, foreign weather reports, foreign plantings, etc. will be watched daily, if not hourly. Developing nations' agriculture will get better and compete with commodity farmers. I think it eventually will get to a point to where what another country does that affects the market in the world will be just as dramatic as that well-needed August rain in the middle of a drought.

I hope that what I have said will create some discussion. I didn't elaborate on the list for that reason and look forward to the ensuing questions and discussion.

Reactor Panels Consider Consequences of Industrialization
Panel One—Production Agriculture

Carmen Fernholz, Swine Producer
Madison, Minnesota

Marv called me several months ago and asked me to be a reactor to what I was hearing the previous day and what I heard this morning, and so I am going to react.

Just a little bit of background. I've been involved with on-farm research primarily with the University of Minnesota, but involved with North Dakota State University with the Rodale Institute and with the Department of Agriculture here in Minnesota.

One thing I've learned over the years is that if research is going to be meaningful to us as producers and practitioners out there, it has to be a two-way street of inquiry, and it has to be an equality of respect of both sides. A lot of this started about 7 or 8 years ago when quite of few of us in Minnesota started questioning the University of Minnesota's research agenda for agriculture. At that time we sat down with the then vice president of the ag school at the university and said, "We would like to dialogue with you about the research here. We don't think that you are answering the questions that we are asking." And so we got going, and this dialogue initially had a referee; but after about four or five meetings, we decided that there were some needs to be met. Eventually, we did create the Minnesota Institute for Sustainable Agriculture, an institute that is made up of 15 board members. Nine of these board members are non-university people; seven of them are practicing farmers. But these are the people who are saying to the university, industry, economists, and sociologists, we want you to answer our questions, and we don't want you to spend the time answering questions that no one is asking.

And so, I come to my definitive reaction to the last day. Here is what I have been hearing. I have been hearing answers to questions that not many of us, and not many of my colleagues, are asking. I have been hearing that producers like myself are still hung up with a nostalgic vision of early twentieth-century farms. I have heard that industrialization is inevitable. And, I've heard that industrialization always means bigger, biggest, bigger yet. And I've heard that industrialization is the only answer to the ever-present, ever-elusive dream of ultimate efficiency. And I've also heard that there is an entity called industrial agriculture not seeking out the public wants and needs, but rather telling the public what its wants and needs must be and then extracting these wants and needs from the producer. That's what I've been hearing.

What have I not been hearing? I have not been hearing the alternatives to industrialization. I have not been hearing that the environmental costs and other externalities are not charged against the cost of food in industrialized agriculture, a sidebar. Who picks up the charge for the 25-million-gallon animal wastes spill? Is that charged against the cost of food? Who picks up the charge for the loss of our social community structures? If we have 150,000 farmers left in 10 years, what communities are going to be out there? Who's going to pick up the loss, the cost of relocating these people? And, finally, I have not been hearing who is speaking for the planet, the flora, the fauna of

this planet; the social structure on this planet; the chain of command in the food production system on this planet.

It becomes quite apparent to me after sitting here and listening that industrialized agriculture is capital intensive and it is becoming more risky as it intensifies. It becomes more risky because fewer and fewer people become the decision makers for more and more people and more and more capital. Case in point, Murphy Family Farms. How many people make the ultimate decisions? Mr. Stanly last evening remarked about how to deal with niche markets, and he said what is a niche market, and I am going to put words in his mouth as I think this is what he was saying: Once niche markets reach a critical mass, some large corporate will get the message and buy them up.

I think that sustainable agriculture, define it how you will, but I think sustainable agriculture, as it is being addressed by such institutions as MISA (Minnesota Institute for Sustainable Agriculture) here in Minnesota, is beginning to reach that critical mass. I say this because we have established MISA in the last several years. I say this because an executive director from the pork producers association in this state came to me yesterday and said, "How can we get some of our checkoff money into doing research for alternative hog management systems?" I say this because a local women's club in my hometown has asked me to come to them to talk about sustainable agriculture. We always say we are not experts in our local community. But when you have local people asking you, then you begin to believe that critical mass may be on the way. And I talk about this because I have on-farm research on my farm. When I can have a top weed scientist in the country come out to my farm and we can sit out in the middle of my field and talk about the questions that I am asking, sustainable agriculture then is reaching the critical mass.

For sustainable agriculture, efficiency is not an issue. I produced 150-bushel-an-acre corn last year on certified organic acres. Volume therefore is not an issue. Quality is a non issue. The hogs that I raise have 52-53 percent lean consistently. I think education is the issue. Industry acceptance is the issue. Educational acceptance is the issue. Market access may be an issue. But I can tell you, I have delivered hogs so far this year. Every one of them was over $40 because I have been able to do the contracting which is a part not just delegated to industrialized agriculture. It is a part of the system of agriculture, if we use it properly.

In closing, I think communication becomes very critical. I've got a young research student at my farm today doing research on Canadian thistle. We've isolated the bacteria that we think can manage to control Canadian thistle, a totally biological thing. But this researcher was setting up the plants two weeks ago, and we needed some thistle in the field. I said, "We have the plots and there were about 50 or 60 thistle in the plots." And he said, "Well, that should be plenty." I said, "Wait a minute. When I cultivate that plot you may not find enough thistle." He said, "Naw, cultivating does not do that." I cultivated the plots, and I think that in each of the plots, there were five or six thistle left. He said, "How did you do that?" I said, "Come on and jump on the tractor and sit and ride with me." In fact, I let him take over the steering. We didn't have too much (cultivator blight ?), but we did learn something.

The point I'm making is we have to be in touch with the people whose needs we are trying to meet. Communication. Two quick quotes I think all of us need to remember. As Sister Mary McGillis said, "Farmers don't grow corn, the earth does." Second, we must always remember that change must come from the people because if the leaders change and the people don't change, the people will kill the leader.

Chapter 8

Reactor Panels Consider Consequences of Industrialization: Panel Two — the Rural Community

Reactor Panels Consider Consequences of Industrialization
Panel Two — The Rural Community

Russell Bjorhus, Director
Meeker County Development Corporation
Litchfield, Minnesota

We have long tended to see city and country as separate places more isolated from each other than connected. This may be somewhat true for large cities, but small towns and their surrounding rural areas have been closely interdependent.

In Minnesota, rural life probably reached its peak in the late 30s, and during the 40s, there began a major migration to the larger cities. People moving to seek escape, excitement, recreation, but largely for a better life through a better-paid job. But the two, rural and urban, are still tied together, and we need to make it work for both.

We all know the figures about the drop in farm numbers, the loss to rural towns in population and business. This change has been taking place since the late 30s, but never so apparent for most communities as the last decade.

Industrialization of rural Minnesota and rural America may be the answer to keeping our population, but not our traditional way or rural life that included viable, small rural towns and small family farms.

Our family farms will grow in size and change dramatically in the way they operate. Farmers will become managers and less involved in the physical work of the farm. Adding value to their farm production before it leaves the community will be the big push by farmers in the years ahead. We are in for the greatest changes in agriculture since mechanization took place with the introduction of the tractor. This change will be propelled by industrialization. The farm crisis of the 80s was really the agony and hurt of rural America crying out because of the rapid changes.

The supporting businesses are also changing, as they no longer serve a large number of farms or farm population. Main street must adjust or die because much of the service it provided in the past will no longer be needed.

The larger farm will often by-pass the local retail store to get a better price in a larger town where a major dealer is located.

I saw this change in rural Minnesota increase dramatically in the 80s when we experienced the farm crisis. Low farm prices and high overhead costs following the inflation that took place in the 70s drove hundreds of farmers off the land.

Since World War II, we have seen the turkey industry change from many small producers to a few large turkey operations. The results have been both good and bad. Good for the consumer, we

have an abundant supply of low-cost turkeys in our grocery stores year around, but bad for our small family farms who can't compete.

We are seeing this same revaluation in other segments of farming with the production of hogs and milk. These large specialized and efficient farms operate on a low margin of profit, making it difficult for smaller producers to make a liveable return on their investment and labor.

These changes are impossible to stop! We cannot freeze in place a dying way of life in rural Minnesota or rural America.

What we lack most today in rural Minnesota is leaders. We don't seem to find them in our government, school boards, or hospital boards. We need leaders with vision and foresight who will work to solve the tough questions.

In the 40s, nearly one-half of the population of Minneapolis either came from the farm or had close relatives who were farmers. Today, that is not true; only a few people have rural contacts, and the metro area will continue to withdraw from the rural part of the state.

A rural town today, unless it has manufacturing (or is within 60 miles of the metro area), will very likely continue to shrink and will have a dysfunctional main street. The question will be can they continue to keep a doctor, dentist, cinema, or a good restaurant?

We are seeing two different areas develop in Minnesota; the well-populated crescent area from St. Cloud through the Twin Cities and down to Rochester. The population of this area is young with better-paid jobs, and it is keeping pace with the world. The other part of the state will struggle to keep up; with a smaller tax base, they will have a hard time to keep up.

Regional centers are developing, such as Marshall, Willmar, St. Cloud, Brainerd, and this follows the rural theory that the smaller town, the more likely it will decline and the more rural the county, the more likely it will decline.

Rural counties lacking significant capital investment and good paying jobs will lose their youth who will migrate to areas where those better jobs exist. Towns with an older population can only get so old before they vanish.

No signs of overall aging of rural towns is more apparent than the closing of a school and the opening of a nursing home or the closing of retail stores and the opening of hobby and craft shops and antique stores.

With these changes, can we be realistically positive about rural Minnesota? Industrialization will save our agriculture production per acre, per cow, per pounds of pork, but it will be the loss of population and community life that will be hard to adjust to.

During the last decade, our large manufacturing companies have had to become lean and mean to compete in the world market. Many of these companies are finding it easier to contract out much of their work than to hire large numbers of employees for whom they are responsible. Smaller companies are picking up these contracts, and they are looking for rural towns in which to relocate.

The relocation is for many reasons: financial help from the towns who want them, lower taxes, lower wages, employees with good work habits, etc. Many rural towns who are aggressive will benefit from these moves.

The consumer will fare well in the industrialization of the Heartland, but besides the regional centers, only the small rural towns with aggressive leaders will survive as viable communities.

Our U.S. ag policies have often helped to hasten this decline in rural areas with the larger government benefits going to the larger farm producers. Land taken out of production no longer requires machinery, seed, fertilizer, and other inputs sold by farm businesses. This has caused many farm dealers to reduce the size of their business or to close shop.

We need new thinking and new state and federal policies to level the playing field of rural America and urban America.

When all is said and done, rural towns, most small rural towns, will not come back again. We are seeing a true change that is opportunity to some and a big adjustment to many others.

Reactor Panels Consider Consequences of Industrialization
Panel Two — The Rural Community

In an Age of Industrialized Agriculture

Rev. Gary E. Farley
Rural Ministries, Southern Baptist Church
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About 200,000 religious bodies serve rural America. Nearly 80 percent of rural residents are related to these congregations. (See M. Bradley et al., C*hurches and Church Membership Study in the US*, 1990, and the *Yearbook of Churches in the US and Canada*, 1994). Incidentally, my denomination, although still found primarily in the states of the Old Confederacy, has the largest number of congregations and adherents in rural U.S. America (about 21,000 congregations and more than 7 million adherents in non-metropolitan counties).

Many, if not most, rural congregations were planted before 1920 to serve the spiritual needs of people in a township-bounded place. This is to say that they took responsibility, most commonly, for a parish or church field that extended about three miles in each direction from their church door.

I find it helpful to distinguish between the two primary origins of these churches. One is COLONY. Many of these are found in the Corn and Wheat belts. Their origin was typically in European state churches. Here in the Midwest, they attempted to recreate the holistic social order that characterized their village back in the Old Country. The traditional social orders of church, education, family, economy, and government should be well-integrated according to this understanding. Personal freedom and individuality were often problematic. I am certain to your mind come the Roman Catholic, Lutheran, and Calvinist communities of this region. And while not from a state church tradition, many of the Anabaptist sects of this region hold to a similar social and community theory. (Most Episcopal congregations would fall among this type, but seldom were they of such numerical strength as to form a colony community. Also, one should note in passing the many colonizing sects of the 1830s and 1840s).

The second category of origin I call CONQUEST. It is pretty much distinctly U.S. American and finds its parentage in the dubious mating of the Enlightenment and Revivalism, but sees itself as recapturing the style and work of Paul the Apostle. Insisting upon soul freedom for individuals, it tore asunder the social fabric inherited from an earlier age. As the frontier expanded westward, missionaries and evangelists traveled in the vanguard. They called for radical conversion of mind, heart, and will. Often, an emerging community would put a "meeting house" where Baptists, Methodists, Disciples of Christ, and Presbyterians or Congregationalists would worship on alternating Sundays in a somewhat cooperative fashion, while each sect declared itself to be the most faithful to Scriptures and their competitors to be mistaken, misguided, heretical, and the like.

They, too, came to accept the township model of community as a bounded place. And across the South and elsewhere, churches and clusters of churches are to be found about every six

miles in communities often named for their entrepreneurial founder, his former home, or some local geographical characteristic. In many instances, these Conquest churches did not have a strong commitment to community ministry. While they took care "of their own" and battled various vices, they may not have been much concerned for projects and activities that aimed at benefiting the whole community. Certainly, they were far less likely to do so than the Colony churches.

The Conquest-based denominations, over time, have often become subdivided into pre-modern and modern congregations. In the late Nineteenth Century, groups of the pre-modern churches splintered off to form new Pentecostal, holiness, and fundamentalist denominations, as well as independent and non-denominational congregations. But in most communities some rural and traditional pre-modern congregations have remained. (Misiologists are now anticipating the Post-modern Age and its various consequences for church life.)

Rural church work changed significantly after the watershed 1908 Rural Life Conference. Most of the older denominations formed national departments which had as their task to "modernize" in thought and practice their pre-modern or traditional churches. (By traditional, I mean a world view that believed deeply that the primary cause of most events, good or bad, was spiritual. By modern, I mean a world view that sought natural and rational explanations of cause, limiting to various degrees the spiritual as the direct cause of events, good and bad.)

The character of modern industrialization (the focus of this meeting) is grounded in modernity. It has sought to rationalize the processes of production and distribution to improve profitability. It has been interesting to me to review the efforts of my predecessors and their colleagues to adapt the language of industry to the life of churches. The rational processes and procedures as well as the terminology of industry were baptized and transposed. Meeting houses became church plants. Superintendents of Sunday Schools and other programs sprang up everywhere. Clock time replaced people time. Tasks, job assignments, training events, and standards of excellence moved to center stage.

Enamored as we were with modernity, at first the denominational rural church program leaders cheered the industrialization of agriculture. Backbreaking and life-shortening work was eased by new and better machinery. Improved productivity brought more money into homes and churches. Better roads, consolidation of schools, and electricity, progress, progress, progress. How we loved it. Many look back on their rural congregations of the 1950s and see the Golden Years of its life. Bunches of baby boomer children, building programs, and bigger budgets were common then.

Few were noticing the impact of the mechanical cotton pickers on African American farmers and communities in the Delta. When many row crops left the South for the broader, more productive plains and irrigated fields of the North and the West, we accepted the gospel of "comparative advantage" and went in quest of smokestacks, changing our farmers to factory hands. While this change of life rhythm certainly impacted church life, it kept a goodly number of people in place in Piedmont, and churches survived. It was a different story in the Blackbelt where pine trees replaced cotton. Far fewer "eyes per acre" were needed to raise trees. Communities dried up and with them churches. But our farming brothers in the Midwest were also seeing their communities and churches die. Pressures to "get bigger or get out" caused farming operations to expand. Most non-metropolitan counties here suffered declining population.

As industrialized American agriculture turned more and more to chemicals for fertilizer and weed control, the theological ethicists among us struggled with a dilemma. True, gains were being made in curtailing soil erosion, but were these being purchased by the pollution of soil and water? Stewardship is the word preachers like to use. It means to use one's resources prudently. It suggests a sense of history which includes taking into consideration the needs of future generations. These ethicists feared that American agriculture had gone awhoring after the false god named Efficiency.

Many of us in rural South might have warned the Midwestern farmers of a second idolatry which issued ultimately in what is called the Family Farm Crisis. This false god is named Monoculture. For the South, it was the Cotton manifestation of this deity that brought that region to its knees in the 1920s. For the Midwest, it was its manifestation as the gods of corn and of soybeans. In both cases, the farmers seem to have moved beyond the balance of general agriculture which had built into it the possibility of good stewardship practices, to an agriculture that was far too limiting, vulnerable, and non-sustainable.

Within the faith community, there are certainly those who are calling, somewhat like the Recabites of the prophet Jeremiah's day, for us to not only reject the false gods of efficiency and of monoculture, but for us to also reclaim the old six-mile communities that were once served by the COLONY and by the CONQUEST churches. However, I fear that this might be yet another idolatry.

Realistically, the six-mile community was a time-bound form, reflecting the limitations of movement characteristic of a pre-modern world. If we can't go back, can we make the formation of the new patterns of community a priority? This is what I have heard the Floras, Jan and Neal, calling for over the past decade. My application of this message has been to talk to our church leaders about seeing the town selected for a Walmart or other major discount retailer as the center of a new 30-mile community, often a county. The other old six-mile communities become like neighborhoods within the 30-mile non-metro equivalent of a city. I see three important tasks for churches within this pattern: (1) model and support the formation of these new communities, addressing the old rivalries among the towns; (2) reformulate their understanding of a parish from 6 to 30 miles, from bounded to central place theory; (3) offer a prophetic critique from a Biblical base of the plans, process, and sins that will attend these changes.

If policymakers believe that the restoration of community in rural America is important, if they truly value people, and if they want the legacy of a good land passed to future generations, then I hope that they will involve the churches in the process. Certainly many of them will need to reformulate their paradigms and valuing of community, peoples, and places. But there is within the teachings of the churches truth about neighborliness, cross-bearing, service, love, and resurrection that can empower these efforts. There is precedence. This is what was done in the 1908 Rural Life Conference. And lots of good things resulted. Most of us have been impacted positively by that effort. So, I hope that we will do it again. And again, as shortly the wave of change resulting from the implementation of the Information Age and from the earthquake of Post-modernity will wash across rural America, its people, and places.

Reactor Panels Consider Consequences of Industrialization
Panel Two — The Rural Community

Karen Loftis
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When asked to describe the community in which you live, what do you think of? Do you describe the buildings and streets? How many people live there? The major employers and sources of income? All of these characteristics, combined with quite a few others, contribute to form an overall picture of the community and its characteristics.

There is a commercial on television speculating on the ramifications of a butterfly flapping its wings in the Amazon rain forest. This action sets off a change of events that ultimately climaxes in a thunderstorm that knocks out the electrical power in the home of the customer this particular advertiser is trying to reach. The message: even a small change halfway across the world has ramifications far beyond those that are most immediately visible.

In comparison to that butterfly, the economic and social changes brought about by industrialization in agriculture could be viewed as equivalent to a tornado slamming into rural communities. Within the rural community where agriculture has been a major source of income for residents, changes are definitely taking place.

From my capacity as a resource to rural Nebraska communities and business leaders, I've had the opportunity to interact and work with individuals who are attempting to respond to the changes taking place by making the most of new opportunities. The response to industrialization that I've seen has been in an increasing demand for entrepreneurial training.

Introduction and Background on the Nebraska Fast Trac Program

The primary objectives of Nebraska Fast Trac program are to

1. help entrepreneurs and small business owners create and evaluate new business ideas;
2. develop and implement business plans
3. plan growth and expansion strategies
4. provide participants with follow-up support from their local business community
5. create new jobs through the startup or expansion of businesses.

The Fast Trac program is a 40-hour, 11-unit intensive training program that guides participants in the process of writing a business and marketing plan for a startup or existing business.

Participants produce, for themselves, a complete business plan. The Fast Trac curriculum serves as a guide, pointing participants toward issues they should consider in relation to their business.

The course covers a broad range of issues that should be evaluated and considered by business operators. The 11 sessions focus on the entrepreneurial mindset, the management team, legal aspects, marketing analysis, marketing research, marketing tactics, managing financials, financial documents, traditional money sources, alternative money sources, and negotiations.

Participants are provided with a set of three course books as well as a notebook of supplemental materials collected from local, state, and regional sponsoring business resources. Each evening class session focuses on a different aspect of a written business plan and includes a guest speaker. Participants submit assignments to their instructor each session that combine to form the end product, a completed business plan or feasibility study.

The target audience for the Fast Trac course includes

1. entrepreneurs considering starting a business
2. existing business owners
3. management team members (corporations, etc.)
4. any enterprise that would benefit from having a business plan (including farms, professional practices, etc.)

Fast Trac courses are organized around the theme of "Business, Government, and Education working together to create jobs for Nebraska communities." The key to Fast Trac's success is a statewide network of public/private partners working to support small business development training and other activities to improve local economies.

The program is organized around coalitions. Regional and/or local coalitions work with the state coalition representatives of statewide business, government, and education sponsors to ensure the program is meeting Nebraska's entrepreneurial training needs. Public and private groups with an interest in economic development are welcome and encouraged to participate as a coalition partner. Each coalition member is equally important in the decision-making process. The real action and emphasis with the Fast Trac program are at the local level. The list of local coalition members and sponsors in Nebraska numbers over 300 after 2 years of program activity, and the number of sponsors is increasing as local coalitions continue to grow and expand.

Local coalition membership reflects the business resources within the host community. While there is no standard rule for who should be involved in the local host coalition, successful coalitions have included banks, private sector businesses, news media, the community college, the school district, local entrepreneurial and small business support groups (Chamber of Commerce, SCORE, etc.), Cooperative Extension, and pubic-sector business resource providers (SBA, Department of Economic Development Field Staff, etc.).

This training has had immediate and long-term impacts upon the businesses that have participated. Evaluation results of course participants have shown a job creation figure of .8 jobs per course participant immediately after completing the program. Follow-up evaluation of these same

business owners one year later showed a job creation figure of .9 jobs per course participant or for the original 100 course participants, 90 jobs.

How Does Fast Trac Relate to Industrialization of Agriculture?

Nebraska is a network of many small communities. Of the state's 535 communities, 90 percent have fewer than 2,500 residents. In contrast, more than 60 percent of Nebraskans live in communities with a population larger than 2,500. The majority live in Omaha and Lincoln. Agriculture has traditionally been at the heart of Nebraska's economic base; however, the economy has diversified over time. Today, the number of Nebraskans involved in hands-on farming is in the minority. Agriculture as an industry is changing, and new types of job opportunities are being created.

Fast Trac courses have been held in communities of all sizes throughout Nebraska during the past 2 years: from Omaha, population 335,000, all the way down to Neligh, population 1,700. Roughly two-thirds of the people who have participated in the program were small and/or rural Nebraska communities. Businesses of all shapes and sizes have participated in Fast Trac courses. Of the 400 program participants thus far, roughly 15 percent were involved in an agricultural-related business. Approximately half of program participants have been existing business owners writing business plans to evaluate their present enterprises, and the other half have been start-ups evaluating ideas for a business.

The connection between entrepreneurial training and the impacts industrialization in agriculture has had become more apparent when you talk to the individuals who are participating in these courses and seeking information on how to start and run their own business. Changes in agriculture, industrialization, technology, environmental issues, and pubic policy have opened opportunities for new and specialized business products and services. The entrepreneurial spirit is alive and growing in rural communities as residents respond to the economic and social changes that are taking place.

Agriculture, Entrepreneurism, and Communities

During the past year, we have held a number of training events in response to the expressed interests of Nebraska entrepreneurs, business owners, and community residents. One of these was Forum, similar in agenda to this conference, but different because the audience was made up of Nebraska agricultural producers, agribusiness representatives, entrepreneurs, main street business owners, and rural community leaders. The theme was "Linking Agriculture to Communities," and the agenda focused on the questions: Can We? Should We? How?

One of the key themes that emerged from the day's dialogue is that every community is linked to agriculture in some way in the chain of production, processing, and consumption. While the connection may not seem as apparent to the urban resident, the products on their grocery store shelves serve as a tangible reminder. Agriculture is always going to be a necessity as it is the source of the food that we eat. What is subject to change is the way in which it is produced and the products that are consumed. Entrepreneurial opportunities abound as changes in agricultural production techniques in response to environmental regulations create demand for new products and services and as changes in consumer tastes create opportunities for new or specialized crops.

Social changes within communities occurring in response to industrialization also open a window of entrepreneurial opportunities. Many of the business owners participating in our Fast Trac training in Nebraska are businesses forming to diversify a farm operation. The need for extra income and the fact that farming alone was not paying the bills are frequently cited reason for going into business within the rural community. Another commonly cited reason is the need to create a job for oneself because there are no other jobs within the community. Quality of life and a desire to remain in the smaller community provide the incentive to build a business.

The primary point of agreement at our Nebraska Forum was that the merits of industrialization in agriculture are viewed differently by each individual and community. For some, industrialization has brought many positive impacts; for others, the changes are viewed as negatives. But what can be agreed upon is that these changes must be responded to in an entrepreneurial fashion. The communities that focus on maximizing the opportunities these changes offer and that respond positively to maintaining the characteristics of their community that they most value are the communities that will thrive.

Chapter 9

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Reactor Panels Consider Consequences of Industrialization: Panel Three — Food Firms and Their Customers

Reactor Panels Consider Consequences of Industrialization
Panel Three — Food Firms and Their Customers

Dr. O. Peter Snyder, Jr.
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St. Paul, Minnesota

The Food System

In my presentation, I will talk about the people of the United States, and then the world. The first and most important need is to provide sufficient calories to keep people alive, a major challenge for the future in many parts of the world. I will also discuss the role that food plays in optimizing the quality of people's physical health and pleasure. Remember, first we must eat to stay alive. Second, we eat for pleasure. In the United States, sometimes these two get turned around by the consumer because food is so abundant and inexpensive. "Junk" food is often very pleasurable while containing empty calories.

America's consumers and consumers worldwide are the driving force for new products and services in the food industry. All food and food service companies focus on the need to please the consumer and create repeat consumer sales. A food company makes food, not because it is good for us, but because it will outsell competitors.

The Consumer

Let's first describe the consumer today and the changes that I foresee in the consuming public of the future and what they will purchase.

First, I believe we must think about, not only the United States, but this planet called Earth. In the very near future, 20 to 30 years from now, international travel will be commonplace. Barriers to international trade will come down, even more than they have. Truly, there will be a "single world" of people. The United States today represents the beginning of this "melting pot" of people.

This blending of all types of people is bringing about an interesting change in food. As races and ethnic groups intermix, they learn about all forms of cuisine and are mixing what pleases them, such as Japanese/American, French/Italian, Canadian/Brazilian, etc. In the United States today, we witness a blending of the cuisines of the world. As such, it is acceptable to use all varieties of ingredients and processes, combined in unique ways, as long as the results please the palate. Nutrition is often "put off till tomorrow."

At the same time, however, a problem is developing, in terms of the lowering of people's immune systems and the population's reduction of resistance to the contaminants associated with food. The microorganisms, such as *Salmonella*, *Staphylococcus aureus*, and *Escherichia coli*, which once we were able to better tolerate, can no longer be tolerated at the same levels. The population is becoming less resistant to pathogens found in food. Food will never totally be free of pathogenic bacteria, nor do we want food to be free of pathogens because their presence is necessary to maintain

our immune systems. This allows us to travel throughout the world, or go hiking or camping, and not be killed by food contamination.

But, the indiscriminate use of antibiotics in growing food animals or of pesticides and insecticides in controlling insects such as flies is not good for the consumer. The microorganisms become resistant to the antibiotics, and the insects become resistant to the insecticides. Our bodies are not prepared to compensate for these new forms of resistance. We need to "go back to basics" and realize that having screens on windows in chicken barns to keep out contaminated flies, keeping birds out of barns, drilling wells to obtain clean, pathogen-free water for livestock, and practicing good sanitization principles in our water farms and land farms are central to the future production of food that allows each of us to have long, disease-free lives. We will always be exposed to pathogens because the animals, insects, and birds throughout the world will always carry pathogenic bacteria. We cannot create a population who must live in protective "bubbles" tended by doctors to keep us alive. In fact, we must do our best to stay out of hospitals.

It is particularly disturbing that the United States today, the USDA and FDA, are inept in terms of controlling food processing and still focus on visual inspection of food and facilities to protect the public. It seems that change is still years away. These agencies can only tell the public to "cook the food well done to kill *E. coli* in beef." In fact, *E. coli* 0157:H7 is reasonably easy to destroy in a hamburger. But, the cook must have a correct temperature-measuring device, specifically a thermocouple, to verify correct food pasteurization. A hamburger cooked to 150°F is actually safe to eat. A hamburger cooked to 150°F is a desirable pink, juicy hamburger. By understanding that all animal, poultry, fish, and seafood are really cooked/pasteurized to make them safe, not merely to taste good, we do not need to immediately solve the problem of trying to eradicate the disease-causing rodents, insects, etc., of the farms and ranches, that contaminate the feed and water, and hence, contaminate the animals.

Unless we choose to use ionizing radiation to pasteurize food, it will not be possible to satisfy the consumers who want to eat their food prepared in a fresher state than ever before, because we will not have pathogenic microbiological control over the growing and raising of our water and land-based foods, for many years, if ever.

We are beginning to see an evolution in the way we think about producing safe food. It is called Hazard Analysis and Critical Control Points, or HACCP. It is a process safety management problem prevention program, rather than an inspection and punishment system that the government uses today. It works. But, government inspectors must learn process control. Therefore, changing to HACCP has been very slow. It is easier to implement HACCP directly within the industry than to train regulatory authorities. It is actually being implemented more at the retail level than on the farm. This will not be very effective because it is easier to keep Salmonella out of food than to teach 260 million Americans how to cook food to a minimum of 150° to make it safe at every meal.

One must remember that there is no "perfect food." Microorganisms are not the only problem. Any food item in excess can kill a person because of natural food poisons.

Consumers Want to Live Forever

Actually, we need to consume the correct amount of nutrients. We often feed our pets more balanced diets than we feed ourselves. The best nutrition and eating pattern for a long, disease-free life is to consume a broad range of lightly prepared, pasteurized foods that are more digestible and have had their pathogens reduced to a safe level.

Less than 50 years ago, half of the U.S. population was needed on the farms to feed the other half. Today, it takes less than 3 percent of the people in the United States to feed the rest of the population. What is the remaining 97 percent doing? They are sitting on couches, watching television, getting little or no exercise, and wanting to eat low-calorie food that satisfies their desire for food, but does not make them fat. Getting rid of fat in food will not solve the problem. People need to eat less and consume fewer calories if they do not do calorie-burning work. Actually, we are returning to the "forbidden" practices of the early 1900s, such as putting sawdust in hot dogs. Putting methylcellulose in our food to reduce calories is no different. But now, it is done to reduce calorie content. We are selling thickened water in salad dressing at $3 a pound. While we are cutting fat, we are not cutting calories. We are not cutting carbohydrates and protein. There are still too many calories for the activity for most people, especially in the United States.

There is also the continuing trend of more people dining out. I do not see an end to this, because it is convenient and saves time. Even as recent as the 1930s, there was no choice; people had to kill and pluck the chicken, for instance, and really "cook from live" each meal prepared at home. It took hours to prepare a meal. Today, the objective for many people eating at home is to cook and eat the food as fast as possible, say within 15 minutes from preparation to the end of the meal, so that they can go on to something else, such as watching television, going to a movie, or some other form of entertainment.

As our technology rapidly moves forward, I believe that each person will lay out a 100-year plan of his/her life. The aging process will be slowed, so that people in their 80s and 90s will be in better health. They will search for "eternal youth" and "perfect health," for which food plays a major role. But, there is no "perfect food," as I mentioned previously. All food can cause disease and death if not consumed in the correct amount. So, for the best nutrition and long, disease-free life, people will need to consume a variety of food, but in moderation.

Because of advances in computer and information technology, people also will be networking with knowledge bases and will continually increase their understanding of the processes of the world throughout their lives. They will be much smarter, and lifelong continuing education will be the norm. They will be able to learn entire technologies in few weeks or months. They will know about nutrition, medicine, food chemistry, etc.

What Will the Consumer Want to Eat?

The current consumer trend is to purchase fresh, but ready-to-prepare food. This is apparent in the market in the form of, for instance, shredded cheese, cut chicken for stir fry, pre-cut lettuce, broccoli, cauliflower, etc. for salads, pre-cut melon chunks, baked and sliced bread, etc. Consumers want the pre-preparation done for them. In the last 50 years, the major technology trend of the food processor has been to move away from canned, sterilized foods, providing a greater variety of fresh, ready-to-heat-and-eat food. This trend has been brought about in the United States and worldwide because we have excellent transportation systems, which can, for instance, bring

foods from South America to North America in a few hours to satisfy the desire for tropical foods in the middle of winter.

While 50 years ago, we were limited to the growing seasons of the various regions in the United States, today there are very few foods that are out of season, because they can be imported from other parts of the world. I believe that this transportation capability, combined with the consumers' desire for increased freshness of their food, will push the trend toward a variety of fresh, ready-to-heat-and-serve foods being available at the food market. All fish will be filleted, chicken and meat cut, just as most of it is today. Peas will not be frozen or canned; they will be fresh flowerets. Corn will be fresh on the cob or cut off the cob in a container, ready to heat and eat. All pre-preparation work will have been done for the consumer.

In every city, there will be local fresh food processing commissaries where potatoes will be peeled and cut, melon and fruit peeled and cut, vegetables made ready. Meat, poultry, and fish can be partly prepared. Foods can be cooked to low temperatures of 135°F to make it safe and reduce final cooking to a few seconds to blend flavors. This food today can have a 15-day refrigerated shelf-life. A little technology can extend this to 60 days.

People who live in groups, such as in retirement centers, hospitals, or prisons, will have fresh meals prepared centrally and distributed every few days, just as milk is delivered today. These meals will be balanced nutritionally and individualized for each person. One major improvement will be that art will be reintroduced to cooking, and the presentation on the plate will be beautiful. The computer will make this possible.

People will cook by a method called "speed scratch cooking" so that they can prepare an interesting meal if they wish, with ingredients from the food market, in 5 to 8 minutes. The combination microwave will play a role. But, kitchen appliances will have high-power cooking capability so that the cooking takes a brief time, 10 seconds to one minute. The meal will be planned by the computer, which can track the nutrition over a long period.

The flavor of the food will be based on the ethnic and cultural backgrounds of the people in the house or group. It will be called "fusion cuisine" because it will fuse all flavors of the world into the basic cooking and processing methods.

The restaurant will use the same labor-saving practices. Restaurant food will come from the same commissaries. There will be virtually no pre-preparation in the kitchen. Chefs will be highly skilled with bachelor's or master's degrees in food science and nutrition. They will be helped by robotic cooking devices. Dish washing and pot and pan washing will be fully automated. The people who serve the food and clear the tables will load dishes and tableware into the warewashing system. It will unload itself and stack plates and store silver and glasses for the next use. There will be a drastic reduction in the indiscriminate use of disposables such as cups, plates, and individual condiment packages.

There will be virtually no ecological impact from the waste from restaurants. Animals will be fed trimmings and food waste. There will be no smoke from cooking. Water waste will be pre-treated before being released into the city sewer.

How Will People Shop?

It will be difficult to tell the difference between a food market and a restaurant. Both will have ready-to-combine ingredients and finished food. It will be more a question of size and variety of offerings.

Depending on whether a person wants to prepare food using "speed scratch cooking" at home, bring an entire meal home, or dine out, all of these experiences will be very convenient and fast. Fortunately, much of today's deep fat frying will be replaced by hot air oven, microwave baking and roasting.

I suggest that because people will want to be entertained a lot, they will tend to live in tower complexes, but apartments will still have gardens and a feeling of nature, without the residents' wasting time maintaining a house. People will be able to get to a variety of entertainment and cultural events in less than 15 minutes with mass transport systems.

Summary

The future can be quite an adventure if we allow it to be. It will help to have government downsized so that the consumer can buy directly from suppliers who certify the quality of their food and, because of their zero-defect Total Quality Management programs, rarely produce a product that displeases the buyer. Because of lifelong learning, people will make wiser decisions about the food; and hence, there will be less chronic disease worldwide and less need for doctors and hospitals. Each individual will be proactive and take responsibility for nourishing their bodies intelligently. We will only need to worry about enjoying our work and our lives.

Reactor Panels Consider Consequences of Industrialization
Panel Three — Food Firms and Their Customers

James R. Jensen, Executive Director
Michigan Food Processors Association

Introduction

Michigan Food Processors Association is a 90-year-old trade association representing primarily fruit and vegetable processors. The comments included in this presentation are therefore from the prospective of specialty food crop processing as opposed to the meat and grain processing which dominate other areas of the United States Heartland.

The specialty crop view of industrialization of agriculture may provide a unique prospective and insights not normally provided by traditional crop agriculture. Fruit and vegetable production, processing, and marketing in the Heartland have already moved significantly toward industrialization. This movement has occurred earlier than in traditional crop agriculture because of a near absence of governmental economic influences on fruit and vegetable production through commodity support and production restriction programs.

The comments that follow are therefore from this unique prospective, that of specialty crops which have already experienced many of the changes associated with industrialization.

General Implications

Several changes have occurred in Heartland food processing which appear to be consistent with the concept of industrialization of agriculture. These changes have general implications in the following six areas.

♦ Raw Product Procurement

Nearly all food processors have increased communications with the producers who supply them with raw products. This allows food processors to respond properly to changes in the raw product input stream caused by mechanization and increased size of farm production units. An example of this type of response is the dramatic changes in raw product materials handling in food plants necessitated by the move toward increased mechanization and use of bulk systems by producers.

A second and perhaps even more vital reason for this increased communication is the need by processors to respond to their customers' needs and wants. This frequently requires changes in variety and maturity of raw product inputs to the food processor. As will be discussed later, today's food processor is very much customer driven. These customers demand a quality standard which is more stringent than in the past. These increased quality standards must be communicated to the producer community associated with individual food processing operations.

There has been a reduction in the size of the raw product procurement staffs at most food processing companies in recent years. This has occurred because of increased demands on food processors to operate more efficiently in an ever-more competitive environment. While there are now fewer people on the staffs of food processors to communicate directly with producers, the increased use of modern communication technology coupled with drastic reduction in the number of farm units producing raw products has allowed improved communication between producers and processors.

♦ Global Sourcing of Inputs

Industrialization of Heartland agriculture is clearly dramatically affected by the world market for raw materials, ingredients, and capital. Expansion and improvements in the global distribution system have allowed the rapid transfer of information followed by the subsequent transfer of these inputs around the globe.

There are very few Heartland food processors who do not have either foreign capital, raw products, equipment, or supplies utilized in their operations. Global competition demands that producer and processor alike operate in the most efficient manner possible to assure their survival. These demands continue to drive the move toward industrialization.

♦ Technological Changes

Many changes in food processing operations (particularly in materials handling) have occurred because of changes in on-farm production related to bulk handling and harvest mechanization. Obviously, the impetus for change has also occurred in the opposite direction. Technological changes within food plants have led to changes in food production practices. An example of this is use of new technology by food processors to detect minute levels of pesticides and other food additives which has led to the increased the use of practices such as IPM (Integrated Pest Management) by producers.

Food processors may be "behind the curve" in implementing technology when compared with other industries. This will mean that the rate of such technological change will undoubtedly increase as the food industry attempts to remain competitive.

♦ Labor Sourcing

Many commentators on the industrialization of Heartland agriculture have referred to the demographic changes occurring in rural communities. Similar changes have occurred in the work force of food processing plants in the Heartland of America (and indeed throughout the country). Most food processing plants utilize migrant workers to staff their "seasonal" labor force. The use of traditional local labor has greatly declined. Whether this is the result of local demographic changes or a cause of these changes is unclear.

What is clear is that food processors must change their employment practices if they wish to continue to staff their plants with the desired number of employees possessing the required skills. Food processors have increased their in-house training programs, formed numerous alliances with local educational institutions, and, in the case of more progressive companies, trained and promoted former migrant workers who are now permanent residents of the local community.

Many processors have also come to the realization that given the competition for the available local labor force, improved wage and benefit packages must be offered to attract and keep qualified employees. These firms have also recognized that it is cost effective to remain part of the rural communities near their source of raw product supply and beneficial to their own well-being to be a positive force in the community. It should not be forgotten that the employees of food processing firms also recognize the benefits (and drawbacks) of the rural lifestyle.

♦ Production Efficiencies

Food processing is and has always been a very competitive industry. The industrialization agriculture has led to the increased use of technology in food plants and the establishment of larger facilities. This has in turn required large additional investment of funds. Whether these funds have been supplied by creditors or stockholders, the funds have been invariably accompanied by increased demands for returns on investments.

In striving to meet these demands for returns on investments, food processing firms have in recent years implemented numerous programs to increase production efficiencies. When these programs have been managed properly, they have contributed to increased earnings and subsequent return to equity holders and lenders. Where these programs have not been successful or were considered unworthy of implementation, local communities have felt the painful implications of plant closings and layoffs, serving to further exacerbate the problem of the decline of rural communities.

♦ Customer Service

The evolution of food production, processing, and packaging has been driven by increasing and ever-changing demands of customers. Successful food processing companies have increased communications with both suppliers and customers.

Frequently, the desires of retail consumers are transmitted to food processors by major retailers and food service distributors. The consolidation which has occurred in the production and processing areas of agriculture has also occurred in the distribution sector. Large super-markets chains, warehouse stores, and mass merchandisers have transferred the demands of consumers for a safe, nutritious, and economical food supply to processors who have in turn relayed these demands to agricultural producers.

Implications to Specialty Crop Processing

♦ Formalized Supplier Relationships

Many of the changes in food processing have also occurred in the specialty crop areas of fruits and vegetables. Indeed, many of these changes have occurred earlier than in the grain and meat areas of agricultural production.

Most processors of fruits and vegetables recognized long ago that formalized relationships with their suppliers, especially raw product suppliers, was necessary to meet ever-increasing demands of customers. This has taken the form of supply contracts, joint ventures, and the formation of cooperatives. One of the positive results of these arrangements has been a dramatic improvement in communication between the parties. This has led more producers to the conclusion that every one's goal ought to be the maximization of profits in the total system and not the seeking of profit as the result of the loss of another group.

♦ Production Variety Changes

Nutritional concerns of consumers have caused the demand for fruits and vegetables to increase as consumer awareness grows. This has led to a corresponding dramatic increase in the varieties produced and shifts in the type of processing of these crops.

♦ Harvest Labor Shifts

The increasing mechanization of production of fruit and vegetable crops has occurred in conjunction with major changes in the availability of harvest labor. Several Heartland crops (strawberries and cherries, for example) are now produced almost exclusively for the canned and frozen markets with the vast majority of production of these crops for fresh consumption occurring in the western United States and Mexico where sufficient hand harvest labor is available.

♦ Material Handling Improvements

Significant advancements in materials handling at the processing level have occurred as the direct result of changes in production techniques coupled with customer demands for fresher and safer food supplies. These improvements in food processing materials handling systems have been rapidly adopted because of the associated increases in production efficiencies and return on total investment.

The Future of Food Processing

Several of the trends will continue as the food processing industry moves into the 21st century. The issue will not be which sector, production or processing, is driving the changes, but whether all sectors are acting in a coordinated manner.

Larger Plants

Plant size as measured by production capacity will likely increase. In an every increasing effort to increase production efficiency, the physical size of plants will not increase at this same rate.

Increased Use of Technology

The use of electronic controls and defect detection, robotics, and newly developed processing and packaging techniques will be increased. These trends will, of course, lead to the demand for more highly trained employees.

Increased Output Per Labor Hour

The production of individual producers has increased dramatically in recent years. This trend is likely to be mirrored in the processing industry with dramatic increases in output per labor hour not only expected, but required to meet ever-increasing performance goals.

Increased Rate of Plant Closing/Modifications

Food processing companies armed with more data about costs, production rates, and changes in demand will make major modifications in plant design and product mixes more quickly than in the past. This will, in some cases, lead to plant closings as food processors attempt to respond to customer demands.

Increased Influence by Customers

The increased use of techniques like Efficient Consumer Response (ECR) will mean that the influence of customers on all areas of food production will be correspondingly increased. This response will be rapid and more precise than ever before.

Increased Influence by Global Forces

Agriculture in the U.S. Heartland is obviously part of the total global food economy. As the influences of these global forces increase and are more clearly understood, producers, processors, and distributors alike will need to respond quickly to remain competitive. This will cause even more changes in Heartland agriculture.

Conclusion

Food processors have already felt many of the implications of industrialization of Heartland agriculture. While many in the industry recognize the changes occurring as inevitable, management must attempt to balance the economic effect of these changes with societal impacts as rural America evolves into the 21st century.

Reactor Panels Consider Consequences of Industrialization
Panel Three — Food Firms and Their Customers

Mark Ritchie, Executive Director
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I want to focus on those buyers that we were just talking about, the consumers, and the people with whom they interact: the supermarket managers, chefs, and the people who run the restaurants. That's really who is buying food products ultimately. I always remember one particular story about this, which reminds me each day about where the customer fits into this equation.

Our organization, the Institute for Agriculture and Trade Policy, produces a number of bi-weekly and monthly news bulletins on food and agriculture issues such as food safety, biotechnology, and farm policy. I was very surprised when a number of farm organizations in Africa began ordering these publications. I was speaking at a conference in Austria sponsored by the Kellogg Foundation, where I met a number of the people who subscribe to these newsletters. I asked them, "Why do you subscribe to these newsletters?" They answered that they were producing crops and commodities for markets in the North, both the United States and Europe, and wanted to know when a new food fad would be affecting these markets. They said that there were many times when they lost their markets because suddenly the chemicals they were using were no longer allowed or when consumers suddenly refused them, like the scare of Alar on apples. They decided they had to know what was the next food trend because of the capital investment and the amount of time it takes for them to readjust their food production and food processing.

I think this problem is faced by all producers, both overseas and in this country. We've got to know where consumers are going if we're going to know where our industry is going. The industrialization of agriculture is one direction, and specialization is the other. But which can bring the most benefits? An analogy worth examining is the decision we made in this country that our agricultural export commodities would be primarily raw commodities. The Congress made agriculture policy which primarily reinforces this direction, the shipping of raw products overseas. While this approach was very good for some companies, I think it's been a disaster for much of our industry, especially those pushing for more and more value-added products. The decision that was taken, that we would specialize in commodity-type export agriculture as opposed to high-end value-added, is similar to the idea of favoring the industrialization of agriculture over specialization. A decision to pursue one path, industrialization, has many implications. It is not one that I favor, because it seems be counter to the trends of where profit is being made in our industry.

I like to look at Europe, particularly in the supermarket industry in Europe, to see what some of the trends are and where things are going because I think it does have implications for us. One of them is that there is a very, very high level of concern about consumer information. People want more labels, more information, more knowledge; but if you want industrialized agriculture, you don't want more information, more knowledge. This fight over bovine growth hormone, BST in the labeling is an example. The second thing is that the supermarkets in Europe don't want any trouble, for example, the problems with chlorine, products that contain chlorine and its by-product, dioxin.

We're now seeing many problems in terms of cancer and a lot of other health concerns, which means consumers don't want to see PVC wrap and products containing PVC. The largest supermarkets in Holland and Germany have told the suppliers that they won't accept anything wrapped in PVC plastic. I would venture to say that there isn't anyone in this room who doesn't have someone in his family or close friends or where he works not affected by cancer. Many people believe that many of the health issues we face today are related to our food system. Ninety percent of the dioxin in our bodies comes from food, mostly dairy products and meat products. People are beginning to read about this. They're beginning to ask a lot of questions about food safety. The two most recent polls that we have, one conducted in Canada the last week of May and the other by the Food Marketing Institute, indicate a very, very sharp increase in retail customers' concern about food safety as it relates to their own and their families' health.

So what does this say to us about the trend toward industrialization as opposed to a trend toward more specialization? The idea of pursuing the low end, as opposed to reinforcing the higher value-added products of specialization, would be a mistake. We need to be aware that we are already importing more and more of our higher end, value-added foods. We will continue to see these imports grow unless we choose to concentrate on specialization instead of industrialization.

The second thing is that further industrialization of agriculture is going to hurt the public perception to safety of our food. One of the things that's most startling in the Canadian survey was the sharp increase in the past 3 years in the question of public perception about the safety of food. As long as we aim toward industrialization, we're going to reinforce that kind of negative imaging. We're going to have trouble from that and trouble in other arenas as well.

Another concern that I have is that any push toward more industrialization of agricultural production will reinforce the idea of some people that growing food is somehow terrible for the environment. I often speak to environmentalists who think ethanol is a terrible thing for the environment. When I try to promote ethanol and other non-food uses, they launch into me about the chemicals and the soil erosion.

Industrialization has created negative imaging that puts us in conflict with the very same people who ought to be our allies on getting more and more non-food uses for these agricultural commodities. Frankly, if we can't move away from the petroleum-dependent economy and get on to a carbohydrate economy, we cannot survive. Right now, we have created the negative image among people who ought to be our allies for that transition.

I do think the industrialization direction has some useful components, but I think they are not the ones that we have begun to pursue. Cheaper agricultural raw materials may be useful, but because there is so much price fixing in the overall economy, the benefits in terms of lower raw material costs do not show up for the farmer producers. For me, this is the bottom line: serving consumers in ways that boost the family farmers' bottom line. Those of us on the production and processing side of the food system don't begin to think about the supermarket manager and the restaurant manager and their retail customers. If we don't, we are going to find the goods being replaced by imports from people who are willing to produce high-end, high-quality, high-value products. This may mean the end of agriculture as we know it today.

Thank you.

Reactor Panels Consider Consequences of Industrialization
Panel Three — Food Firms and Their Customers

The Consumer Perspective

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Significant changes are occurring throughout the agricultural sector because the influence of consumers on the U.S. food system has been steadily increasing. Currently, a consumer-driven food marketplace is replacing the producer-driven marketplace of the past (Senauer et al. 1991). The difficulties that the food system is having in dealing with this change is evident in the low success rate of new food product introductions each year. For example, a record 15,006 new food products were introduced in 1994, up 16.3% from 1993 (Friedman 1995), and only up to 10% of them will be successful and survive in the marketplace.

When consumers do not like a product and do not buy it, the product fails because it is not profitable for the retailers to stock it; and it is quickly removed from food stores. Food product success or failure in the marketplace has been accelerated by the availability of product movement data from computerized consumer information systems. These systems can quickly analyze food store check-out scanning data and track how food products move from grocer's shelves. The time interval from food product introduction to success or failure can now be as short as a few weeks or months.

When the high cost of developing and introducing a new food product and the low success rate are considered, it is easy to see that product failures are expensive for the food industry. To help to ensure product success, it is important that producers and product developers carefully consider information regarding who their consumers are and what they want and need before designing new products and introducing them into the marketplace. Marketing food today is based on satisfying the desires of segments or niches of consumers with very specific characteristics, rather than using the mass marketing techniques of the past.

Consumer characteristics help to identify who consumers are, what they know about food and nutrition, what they consider important when selecting their food, and what their future food needs will be. Demographic characteristics help to identify who consumers are (Senauer et al. 1991). The rapid increase in women working outside the home in recent years leaves them with little or no time to cook; therefore, Americans no longer buy food to cook, they buy meals to eat. This leads to increased demand for convenience foods, increased eating away from home, increased use of take-out-to-eat food, that is, the purchase of food to eat at home that is prepared elsewhere. The lower rate of population growth increases competition in the food marketplace, and the increase in the older population creates demands for specialized foods to meet their needs. Other demographic trends that influence consumer wants and needs include increased incomes resulting from increases in

the level of education of the U.S. population, the increase in ethnic diversity in the United States and a continual decrease in household size.

Information from governmental agencies and the food industry that gives consumers advice about what to eat is another factor that affects the food consumers need and want. The well-known *Nutrition and Your Health: Dietary Guidelines for Americans*, 3rd ed. issued jointly by the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services (U.S. Department of Agriculture and U.S. Department of Health and Human Services 1990) recommend that consumers

> Eat a variety of foods; Maintain healthy weight;
> Choose a diet low in fat, saturated fat, and cholesterol;
> Choose a diet with plenty of vegetables, fruits, and grain products;
> Use sugars only in moderation;
> Use salt and sodium only in moderation;
> If you drink alcoholic beverages, do so in moderation.

The Food Guide Pyramid issued by the USDA translates these guidelines into the number of servings of various foods to eat in a day (U.S. Department of Agriculture 1992). As a result of this and additional food and nutrition information available to consumers from other sources, we now have nutrition-literate consumers who are aware of the diet-disease connection (Sloan 1994e,f), the food-mood connection (Sloan 1994c,e,f), the relationship of food intake to longevity and appearance (Sloan 1994f), and preventive nutrition practices (Sloan 1994f).

Consumer knowledge about food and nutrition has led to new trends that affect eating behavior. Consumers now have an increased interest in wellness, and the demand for functional foods and foods that contain phytochemicals is increasing. Functional foods are those that provide physiologic benefits besides nutrition because they contain components such as antioxidants (Sloan 1994a,e), omega-3 fatty acids (Sloan 1994e), vitamin E (Sloan 1994a,e), or yogurt cultures (Sloan 1994e,f). Phytochemicals are naturally occurring, biologically active chemicals found in small amounts in plants. Some of them have anticarcinogenic properties (Senauer et al. 1991; Sloan 1994f).

Factors consumers think are most important when they choose their food are an indication of their wants and needs. Each year data on this topic are reported by the Food Marketing Institute (FMI), a trade association of food retailers, in their annual survey of food shoppers in a publication titled "Trends in the United States: Consumer Attitudes and the Supermarket 1995" (Food Marketing Institute 1995). In 1995, food shoppers' responses ranked taste, nutrition, price, and product safety in that order as factors they considered very important when they selected food. These factors were ranked in this same order in each of the last five years.

Taste was the most important food characteristic that shoppers considered when they selected food, with 90%, or 9 of 10 shoppers, giving it the highest rating of very important. This indicates that shoppers are very aware of product quality and demand high quality in their food.

Nutrition was very important to 74% of shoppers when they selected food. Concern about fat content of food in 1995 was higher than it ever has been in these surveys, with 65% of the

shoppers very or somewhat concerned about it. In addition, 90% of the shoppers considered fats a serious health hazard or somewhat of a health hazard. In contrast, 18%, 20%, and 15% of shoppers were very or somewhat concerned about the cholesterol, salt, and sugar content of food, respectively. But 91%, 86%, and 66% still considered cholesterol, salt, and sugar, respectively, a serious health hazard or somewhat of a health hazard.

Price and **product safety** were both very important to 69% of shoppers when they selected food. Food prices have triggered several strategies shoppers use to economize on grocery expenditures. In 1995, frequently used strategies were to compare prices among foodstores, buy store specials, use coupons, substitute store brands for national brands, make better use of leftovers, and use fewer convenience foods.

Food safety concerns of consumers must be taken seriously, especially the efforts being made to erode the laws and regulations that have served us well to make our food supply safe. Consumers should be alarmed when federal legislation is proposed to substantially change food safety regulations. Proposals continue to be introduced to repeal the Food Additives Amendment of 1958 which contains the Delaney Clause that prevents the addition of known carcinogens to food and requires food processors, not the federal government, to prove the safety of new food additives. These changes have the potential to make food less safe for consumers and to increase governmental expenses to test the safety of food additives, a cost now paid by the user (food industry).

Proposals made to eliminate or delay modernization of the meat inspection system and microbial testing of meat and to improve testing of seafood means a less safe meat and seafood supply for the consumer. Hamburger, the most common source of *Escherichia coli* 0157:H7, would not be tested for this microorganism, and it will continue to be allowed into the food system. The presence of this deadly strain of *E. coli* in meat is a producer problem and only is a consumer problem because producers have failed to control it in their herds and in their barnyards and meat processors have failed to control it in holding pens, during slaughter, and in processing. And food-borne illness from unsafe seafood will not be prevented either.

This is reminiscent of the situation described by Upton Sinclair in his book *The Jungle* that described the American meat packing industry at the turn of the century. This book was instrumental in passage by Congress of federal regulation of the food supply through the 1906 Meat Inspection Act and the 1906 Pure Food and Drug Act (Senauer et al. 1991).

Two additional food safety issues include (1) the realization that techniques available to prove risk and benefit in the food supply are inadequate and (2) the possibility of the states pre-empting the weakened and inadequate federal laws and regulations when the health and well-being of consumers are no longer protected. Are different regulations in each state desirable? Proposition 65 in California has already begun this trend, and it is likely to continue rapidly if changes in federal food safety legislation are made.

Future consumer food priorities can be used as predictors of new product success in the food marketplace. These include convenience (take-out food, home delivery of foods and meals, portable food to eat on the run, meal kits, faster scratch cooking, "speed plus" fresh pre-prepared foods) (Sloan 1994f); concern about fat in foods (Sloan 1994e); single serving products (Sloan 1994f); foods to enjoy (Sloan 1994f); interesting choices (Sloan 1994b, 1995); interesting tastes and

flavors (Sloan 1993, 1994c, 1995) ; greater intensity in food flavors (Sloan 1994c,f, 1993); less meat in meals (Sloan 1994d,f); concern about antibiotics and hormones in meat (Food Marketing Institute, 1995); organically produced foods (Sloan 1994f); multi-cultural cuisines (Sloan 1994b,f, 1995); gourmet foods (Sloan 1994f); specialty foods (Sloan 1994f); health-promoting foods (Sloan 1994e,f); food safety and quality (Sloan 1994a). All of these consumer food priorities will be important considerations in the demand for food and, thus, in the industrialization of agriculture now and in the future.

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Chapter 10

A Summary Perspective

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The speakers, discussants, panelists, and audience participants in this conference have provided considerable food for thought on the industrialization of agriculture. We have been provided data, insights, and alternate points of view about causes and consequences of industrialization. My assigned task is to provide a wrap-up perspective: what have we learned, and what do we need to know?

A beginning observation is that the focus of our discussion has often been unclear. A part of the reason, I think, is that we have diverse views on the definition and character of industrialization. Thus, industrialization has become the "whipping boy" for a variety of rural (even urban) concerns.

In my view, industrialization is essentially characterized by increased coordination among the stages of the food system, accompanied by a shift in decision control toward the demand or consumer end of the chain, and where decision makers see the opportunity to create products that will be successfully accepted by consumers. To ensure reliable supplies of raw materials with consistent, desired characteristics, the decision makers coordinate backward in the supply chain. Industrialization is not the same thing as large scale, but the two phenomena are complementary.

The conference speakers have already provided some factual information, some views on what we think we know, and some questions that need answers. You can reread what they have said in the proceedings. I recommend for your further reading an article by Professor Peter J. Barry titled, "Industrialization of U.S. Agriculture: Policy, Research and Education Needs." In that article, Barry discusses implications for several affected parties and ends with a list of topics and questions that need to be addressed by research, a list that appears even more appropriate after this conference. Barry's observations draw, in part, from a symposium on industrialization held in Washington, D.C., in May 1994, sponsored by the Council on Food, Agricultural and Resource Economics (C-FARE). A brief summary of Barry's observations, modified and supplemented by views expressed at this conference, seems a useful way to summarize what we think we know about the implications of industrialization.

Implications for Producers

Unfavorable:
- Loss of independence for producer participants,
- Loss of markets for nonparticipants,
- Disruption from shifts in location of production.
- The balance of negotiating power may favor integrators to the disadvantage of contract producers.

Favorable:
- Another voluntary option for producers (In fact, some producers will become integrators themselves.)
- Contract production guarantees a market at an agreed-upon price, thus reducing risks.

Outcome: A "tri-modal" distribution of agricultural producers:
- Industrialized units characterized by contract production and integration.
- Independent, large-scale family or multifamily farms.
- Small, part-time farms heavily dependent on non-farm income.

Implications for Resources and Environment

Unfavorable:
- Large aggregations of livestock feeding create potential environmental hazards (odor, water contamination, nutrient overload on fields, etc.).
- Concerns arise about determining ownership and liability responsibilities.
- Industrialization could bring greater government regulation to a sector viewed as corporate farms, not family farms.

Favorable:
- May simplify the process of regulation and compliance.
- Industrialization could improve technology innovation and adoption in response to environmental constraints because of better management and easier access to capital.

Implications for Rural Development and Communities

Unfavorable:
- Industrialization is just one more factor leading to farm consolidation and population decline in rural areas. However, agriculture is no longer the major force reshaping rural America, since the farm-based population is now relatively small.
- If not locally based, industrialization could lead to a flow of management expertise, input acquisition, financing activities, and income from local rural areas to non-local beneficiaries.

Favorable:
- However, if the integrating and industrialization activities are locally based, they could generate direct, secondary, and tertiary jobs and income.

Again, while these points are made by Barry, they are consistent with the insightful presentations made at this conference by Ron Powers and Cornelia Flora.

Implications for Consumers

Unfavorable:

- There is general concern among the population that industrial practices (such as confinement feeding) bring food safety problems, such as microbial contamination of meats and poultry, antibiotic residues in animal products, and unnecessary food additives.
- Large-scale confinement feeding that typically accompanies industrialization of livestock sectors raises concerns about animal well-being and treatment.
- There is some concern about product proliferation, excessive advertising, and other wasteful practices.
- Some are concerned about ultimate outcomes of current trends toward consolidation of firms in terms of monopolization of the food retail sector.

Favorable:

- Consumers have larger supplies of products they want at relatively low prices.
- Industrialized firms are very sensitive to consumer concerns, including food safety and health issues, and have the resources and motivation to produce safe products as well as a variety of new products for health-conscious consumers.

Implications for Policy

Traditional commodity policy is based on moderate-size family farms producing undifferentiated commodities in an open market system, where individual farmers have little control over risk and price. Industrialization raises questions about the workability of, and need for, traditional agricultural policies as either risk management tools or income support. Structural changes now taking place call for a major reevaluation of the goals and tools of public policy, not only commodity policy, but also policies related to rural development, consumer risks, and other public concerns.

From Peter Barry's list of research needs, modified by questions raised or implied at this conference, I came up with a list of ten questions and statements about what we still need to know about industrialization.

1. How can we preserve and create new options for independent producers? How do producers participate in the benefits of being better linked to the consumer end of the food chain without becoming just hired or contract corporate workers?
2. What, more precisely than we know now, are the impacts on industrialization and various forms of vertical coordination, on jobs, incomes, fund flows, business opportunities, and wealth creation in rural areas?
3. How are changes in the structure, including industrialization, of the food and fiber system related to environmental consequences and policies? Same question for food safety.
4. How do we need to change public policies and programs to accommodate the changing structure of agriculture?

5. How does industrialization affect world trade patterns and our ability to compete?
6. How does industrialization affect competitiveness and power of food companies at the consumer level and within the food system?
7. Are there really efficiency gains and size economics resulting from vertical coordination and consolidation? Who gets these gains?
8. How do we assure or maintain real competition in the food and fiber industry?
9. How will industrialization affect input industries and sectors, including land markets?
10. The big question: Who will ultimately control agriculture, and how will the various public interests be served? In other words, does all this really make any difference, and to whom?

Again, most of these questions are excerpted and paraphrased from the referenced article by Peter Barry. Many more questions could be added. But the list is sufficient to present an awesome challenge to us all and, particularly to agricultural economists, whose task it is to find answers.

Six Postulates About Agricultural Industrialization

I propose to close this conference with six general postulates that will provide a broadened perspective on industrialization and help to frame future discussions on the topic. I call these assertions postulates because, while I believe them to be true, others may sense they are true, but wish they were not, and still others will simply believe them to be wrong. Here they are.

First, industrialization is simply one current manifestation of a continuing process of structural change in agriculture.

Second, structural change in agriculture more or less parallels, sometimes with large lags and leads, changes in the technological and management organization of economic activity in the rest of the economy, and that parallel will become more observable as production agriculture becomes more integrated into the general and global economy.

Third, structural change is an inevitable, natural process that can be observed, and somewhat directed, but not reversed.

Fourth, structural change, including industrialization, can impose large transactions costs; but, over time, the net social benefits are likely to be positive.

Fifth, the societies (economies) that understand structural change and that develop complementary policies that protect and enhance the public interests will fare better than those societies that expend their energies trying to stop or reverse change.

Sixth, social scientists can and should generate understanding of the causes and implications of structural change, understanding that can be used to help design policy and market instruments that reduce public and private risks, reduce transactions costs and inequities in those costs, enhance public and private benefits, and assure an equitable distribution of these benefits.

Permit me to elaborate on these six points.

The industrialization of agriculture is simply a phrase we have coined for the current state of structural change. It is part of a long-term continuing, natural evolution, one that moves in fits and starts, but nonetheless moves persistently. It has been going on for hundreds of years, but it has become a subject of increasing inquiry as the pace of evolution has gained momentum.

For centuries, the pace of change in agriculture was slow enough that the human, institutional, and social adjustments to that change were relatively orderly and nonthreatening. Over the past 200 years, and especially in the twentieth century, the pace of structural change in agriculture, more or less paralleling technological and structural change in the larger economy, has increased at an increasing rate. Farming and farm structure were different in 1900 from that in 1800. Even before 1900, horse-drawn machines were driving consolidation of small farms into larger units. We had not noticed it much up to that point because we were still opening new territory and adding more land and farms to the national base. We sometimes forget that some counties in the Great Plains have lost population in every decade since full settlement was completed in the 1880s and 1890s.

The 160 acres provided under the Homestead Act worked well in the central corn belt, but did not provide an adequate living in the dryland wheat country. Moreover, by the time the Plains were settled, widespread adoption of horse-drawn machinery was making it possible for one family to farm larger blocks of land. The advent of tractors and motorized machinery in the early 1900s and the beginning of a major flow of improved technologies, crop varieties, and management skills from the Land Grant universities held the promise of substantial structural change after World War I. That potential was delayed by farm sector depression in the 1920s, general economic depression in the 1930s, and the risks of making major capital investments in agriculture that kept both borrowers and lenders at bay.

The surge in demand from World War II, the reduction of farm price risks via nonrecourse loan programs, and the establishment of new credit institutions designed to serve agriculture made it attractive to borrow (and lend) money to invest in improved production technology. Thus began the technological revolution and restructuring that brought agriculture into the 1970s. These changes created a large pool of temporarily trapped human resources in agriculture. The excess population in agriculture, the focus of much research and public concern in the post-World War II period, had largely disappeared by the 1980s as a result of retirements, low levels of new entry into farming, and, most important, a booming post-war economy with an abundance of off-farm jobs.

The firm growth and regional adjustment studies of the 1950s, the vertical coordination studies of the 1960s, the “farm structure” studies and debates of the 1970s, and the farm “crisis” studies of the 1980s are examples of our profession’s long-standing interest in the various manifestations of continuing structural change. Structural change is largely grounded in technological change, which, in turn, drives changes in the organization of production and marketing, followed with lags and adjustment costs by changes in the institutional infrastructure that serves and is served by agriculture. The antecedents of structural change are not always clear because often it is the interaction of accumulated technologies in hospitable institutional settings, aided by doses of entrepreneurship, that cause spurts of change.

Rural America was settled basically to populate three resource-based industries: farming, forestry, and mining (including oil extraction). All three industries were once labor intensive. Today,

because of major developments in labor-saving technology, relatively little labor is required for any of these industries, even though all three of these industries continue to see growth in output. The great "shake-out" of rural population from these industries occurred between 1950 and the 1980s. Thus, the agricultural, mining, and forestry population is now sufficiently small that it is no longer the major factor shaping the future development of rural areas.

The "industrialization" phenomenon that is the focus of this conference is largely organizational and managerial in character, but it is made possible by an accumulation of technology, information, transportation, medical, and genetic, to name some aspects of that technology. More is on the way. I expect that over the next decade, there will be a number of conferences, seminars, and writings on the subject of precision farming, site-specific farming, and geographic positioning systems. While this general area of technology is still in its infancy, I have been surprised at the level of interest and activity over the past year or two. Precision farming technology is driven by cost cutting and environmental concerns. This technology will be expensive, at least initially, and thus will not be size neutral. It will likely favor larger field crop farms. Many of you in this conference probably can identify other large and small technologies in the pipeline, all of which will become a part of the continuously accumulating technology/ knowledge base that will keep driving structural change.

In any event, the pace of structural change continues to increase, thereby increasing the adjustments and perhaps human stress related to these adjustments within lifetimes and even within generations. This increases social and political tensions and keeps the issue of structural change on our agenda.

My **second** postulate is, I believe, self-evident and requires only brief elaboration. As all stages of agriculture become more integrated into the global economy, agriculture becomes more susceptible to, or is driven by, all the technological and managerial innovations driving change in other economic sectors. One has only to note how closely the restructuring of the global food industry parallels the reshaping of global communications, manufacturing, transportation, and financial sectors.

In this regard, I found Robert Reich's book, *The Work of Nations*, interesting reading. He points out that modern global companies earn their greatest rewards, not from production activities, but from the entrepreneurship activity of putting production and services together in the most advantageous way to create products that are marketed wherever they are competitive in the world. The returns to routine production and service activities will be relatively low, because they can be performed anywhere by people with modest skills and limited alternative opportunities. The greatest rewards will accrue to the entrepreneurs who take the risks in putting the corporate functions together and to those who provide the creative, scientific, artistic, and legal services that the entrepreneurs need. This suggests that, in agriculture, those who organize the integration of activities and those who provide the genetics, innovative technology, and marketing concepts will reap the greatest rewards, while returns to routine production agriculture and routine transportation, processing, and manufacturing activities will be competitive or low.

There are two principal points here. The first is that we can get insight into structural change and industrialization of agriculture by observing forces driving change in other sectors of the

economy. The second is that returns to production agriculture, farming and ranching, are likely to remain at low, competitive levels.

The **third** postulate is that change is not only an inevitable and natural process, but is also irreversible. We cannot turn back the clock or calendar. The human mind is always thinking of new and different ways to do things, and that can only be constrained (not stopped) by suppression of creativity and thought. An environment or a mind exposed to an experiment or idea is never the same again. Much of the anguish we hear today is nostalgia and fear of change, the stress of the strange, rather than the comfort of the familiar. The calls for a return to small-scale farming and the rural society of yesteryear are unrealistic. I had a wonderful childhood in a small southern town. The town no longer exists, and I cannot even explain to my children and grandchildren what life was like then. But we also had segregation of races, widespread poverty, frequent epidemics of pneumonia, polio, and malaria, and a shorter life expectancy. Many women died in childbirth, and many children never lived to adulthood. Yes, I would like my grandchildren to experience some of the good things about the "good old days," but I do not care to have them experience the bad. What I really want for them is to have a good life and the right values in the context of contemporary society and to be adaptable to change in a positive way.

Some may say that we can preserve small-scale farming and traditional rural life by being selective in the technology we accept and ban. For example, we can adopt technologies that improve health and the quality of life, but avoid technologies that drive structural change. But technological change doesn't work that way, and ideas cannot be kept within neat borders. Moreover, humans have choices, and small-scale agriculture with low income is not the option most who live in a progressive economy choose to accept.

Others point to Europe as an example where public policy has protected and maintained the small-scale family farm structure and suggest we could do likewise here. But those who have looked more closely know first, the cost of the Common Agricultural Policy in the European Community has been enormous to taxpayers and consumers and is likely unsustainable; and second, the structural trends in Europe are exactly the same as in the United States, only lagged a few years.

Again, while we cannot always predict the precise path and speed of structural change in agriculture, we can say with confidence that it is as natural and inevitable as the human thinking that constantly drives technological change. And, once the genie is out of the bottle, it can never be returned.

Fourth, structural change, including industrialization, can impose large transactions costs, but the net social benefits are likely to be positive. Take the familiar case of the mechanization of cotton harvesting. The human adjustment costs were great. Thousands of mostly black workers were displaced and began the last great mass exodus from farms to both rural towns and from rural towns to larger cities. The displaced workers paid a high adjustment cost. But without mechanization, the cotton industry in the United States likely would have declined or disappeared altogether; and the jobs of those who picked cotton and those associated with other industries allied to the cotton industry would also have disappeared. Also, picking cotton by hand provided only six to ten weeks of employment each year, and many of those who picked were unemployed or underemployed most of the rest of the year. In summary, there were likely long-run positive <u>net</u> social benefits from the

shift to mechanized cotton harvesting. The problem was the distribution of the benefits and costs. I will return to this problem shortly.

Just as change is a part of the natural order, so is emergence of gains partly offset by losses. Invent electricity, and we have better lighting and more jobs in the electrical industry, but we lose the personal touch of the lamplighter who is put out of business. Invent automobiles, and we have better transportation and employ more people in the new industry, but the buggy maker and the buggy driver are put out of business. Invent the tractor, hybrid seeds, mechanical harvesters, bulk milk tanks, and, yes, BST, and we have more dependable supplies of high quality food and can offer better nutrition to more people, but we don't need as much human labor and animal (horse) power on the farm. And with fewer people needed on farms, some small towns are not needed unless there is other rural employment. By bringing down the cost of food through greater productivity, we decrease the portion of human effort required for supplying life's basic needs and release more resources for meeting higher order needs, i.e., for improving the quality of human life.

It is true that the transactions costs can pose great private pain and social problems. The early days of the industrial revolution brought child labor as well as adult labor abuses, and it took generations to develop legislation and new social institutions to eliminate those abuses. The introduction of early cultivation led to erosion and exhaustion of soil nutrients, and it took years to learn how to control and avoid those problems. The advent of chemical farming brought another form of environmental degradation, but that too is being brought under control.

Perhaps one of the most subtle and yet pervasive costs of modern industrialization of agriculture and other sectors of the economy is that each wave of so-called progress appears to be more impersonal. Some would say that has led to more human alienation and isolation, leading, in turn, to today's seemingly intractable problems of crime, violence, drug abuse, declining family values, you name it. No doubt, some of these problems are exacerbated by the pace of structural change. But I would also suggest: these problems are not new; and many problems result, not from change itself, but from our failure as a society to equip people to accommodate change.

This lends to my **fifth** point, which is the societies that understand structural change and that develop complementary policies which protect and enhance the public interests will fare better than those societies which expend their energies trying to stop or reverse change. If structural change in agriculture and the rest of the economy is a natural and inevitable phenomenon, attempts to suppress that change will ultimately fail. There will be far greater returns to public and private efforts to maximize the potential benefits from change and to minimize the negative side effects. These efforts likely include investing in better education and training so that people both understand change and are less threatened by it, redistributing some of the net social benefits of change to compensate those on whom the adjustment costs fall disproportionately, and adopting laws and programs that minimize negative side effects of change.

Of course, all this is simpler said than done. Dealing with all the manifestations of structural change quickly leads one into realms of philosophy, politics, and religion. Expressions of nationalism, economic isolationism and protectionism, social conservatism, and religious extremism are sometimes manifestations of fear of change or reactions to the threatening unfamiliar that is caused by structural change. Again, the better people understand change and the better they are prepared to accommodate change, the fewer will be these manifestations of opposition to change.

To get back to the subject of this conference, I believe that society will be better served if we accept that structural change in farming, including industrialization, is a natural and inevitable process and focus our efforts on developing the legal and other institutional frame-works which will help to maximize the benefits and minimize the negative side effects of structural change.

If one accepts these five postulates, does it mean that there is nothing we can or should do other than stand by, observe, and either applaud or weep? By no means! By generating information and understanding about the causes, character, pace, and direction of structural change, including industrialization, we can empower individuals, farmers, rural leaders, and businesses to take actions that serve their self-interests and provide the basis for public policy that can improve the distributive outcomes of change. While much of what I will suggest we do is addressed to my fellow economists, there are contributions to be made by all concerned and well-informed citizens and interest groups.

I can group much of what we need to know and need to do under a few general headings.

First, reduce transactions costs of structural change. To do this, there needs to be better public understanding of what those transactions costs are and who pays them. Some of the costs associated with structural change include lost value of capital invested in obsolete or inappropriate technology and capital goods; human capital (skills) rendered obsolete; relocation costs of physical goods and people; and human stress associated with loss of careers, physical relocation, and loss of the security of the familiar.

There is no way to totally avoid these costs. But they can be reduced. Better widespread understanding of technological and structural developments will enable producers to plan ahead. Education that prepares people with the realization that the pace of change is increasing; and with the emotional and knowledge, flexibility to cope with change is one of the most important investments we can make to reduce the transactions costs of change. We also need to better understand the appropriateness of public policies and regulations in the context of changing structure and new ways of doing business. Sometimes policies and regulations designed to work efficiently within a given way of doing business become costly anachronisms when there are major changes taking place.

Finally, what do we do to reduce the human stress associated with major structural changes in agriculture? Again, as the pace of change continues to increase and people become more accustomed to rapid change as the norm, the problem will partly solve itself. But that could take several generations. In the meantime, we need to prepare people for change with better basic education and continuing education. We also need to improve legal, financial, and social institutional structures that are designed to provide transitional assistance to those facing dramatic dislocations.

Second, we need to find ways to improve the distributive equity of transactions costs resulting from structural change. If there are net benefits to society from adopting new technologies or new ways of doing business, can some of the benefits be used to compensate losers? This is a sticky area because of the difficulties of defining where such compensation is justified and where it is not. In the case of the cotton pickers displaced by mechanized harvesting, many would argue that the adjustment burden fell unfairly on the mostly poor, mostly black displaced workers. But should those who invested and built early automobiles have compensated the displaced buggy workers? Or if a new company invents a cheaper way to make better computers and puts IBM out of business, should

IBM be compensated? In other words, what are the criteria, or can we develop criteria to determine equitable distributions of transactions costs of structural change? If we can do that, do we know the most efficient method of redistributing those costs? Do we redistribute them by internalizing transactions costs into the workings of private markets, or do we use public programs to implement the redistributions, or some combination of the two? What are the criteria for resolving that issue?

These are key questions for public policy specialists. To the extent that we provide career counseling, job training, continuing education, welfare assistance, food stamps, and other forms of general public assistance, we already have public involvement in redistributing transactions costs. To the extent that employers now pay unemployment insurance and support continuing education and skills enhancement, some of the potential transactions costs of structural change have been internalized into the cost of doing business. The point is, we really don't have good measures of the gross and net costs of change, the distribution and incidence of those costs, and how to design means of efficiently reducing inequities. We have plenty of work to do to reduce these knowledge gaps. Failing that, we can always fall back on our tradition of waiting until the political wheel squeaks and then grease it.

Third, we need to create new, and improve existing, institutions that offer producers a broader array of organizational (structural) options. Wayne Boutwell, president of the National Council of Farmer Cooperatives, suggests using cooperatives to integrate farm-to-retail operations and rebate the gains back to farmer owners rather than having them go to corporate integrators. Suggestions along this line have been made by earlier speakers at this conference. There must be other institutional designs that will permit farmers to preserve some degree of independence and yet have competitive access to markets.

Fourth, develop legal and other institutional arrangements compatible with the new structural order and which to help to ensure an equitable distribution of opportunity and power. Neil Hamilton talked about this in the context of assuring a fair balance of power in contractual arrangements. Likewise, there have to be opportunities for new entrants and small-scale producers. Again, this is an area where sunlight in the form of good quality, easily accessed information can be extremely helpful.

Fifth, we must find the most cost-effective combinations of regulatory and market incentive mechanisms to minimize negative side effects of structural change. I am not referring here to transactions costs of structural change, but to negative side effects that may develop as a result of change. Examples are negative environmental impacts and increased food safety risks that may arise as a result of new ways of doing business.

My bottom-line conviction, reinforced by what I have heard at this conference, is that structural change is continuous and inevitable; but with improved knowledge and understanding, we can maximize the benefits and minimize the costs of change. I judge that this conference has made a positive contribution to that end.

To quote Jim Hildreth, longtime managing director of the Farm Foundation, "...hopefully we have moved from cocksure ignorance to thoughtful uncertainty."

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