The Changing Scale of American Agriculture

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Chapter One

Background

At the dawn of the twenty-first century entrepreneurs were transforming American agriculture from a simple cottage industry into an efficient modern system of large-scale food production. Similar transformations wracked the steel industry and the automobile industry a century earlier, and more recently the grocery business has been transformed in the same way.

Massive transformations have serious consequences. They change the status of individuals, and they may deprive individuals and firms of some of their independence, if not their very existence. Some producers have gone under, whether from bad luck, poor management, or some combination thereof, but others have been able to find niches for themselves in the new system, and they have grown larger by consolidating smaller entities into prosperous new firms.

The scale of farming has changed so dramatically that farmers have had to add a zero or two to the way they once thought, whether it be dollars or acres, crops or animals, bushels or head. Once they thought in tens or hundreds, but now they must think in thousands; once they thought in thousands, but now they have to think in tens of thousands or even millions. This simple idea, "Add a zero or two," seems tough for city folk to grasp, but every farmer to whom I have talked has immediately understood what I meant, because it so neatly summarizes how the scale of American agriculture has changed.

Entrepreneurs have driven this change in scale. Many people seem to assume that things just happen, but things do not just happen, they happen only because someone makes them happen. Things happen, places are changed, and new systems are created by the decisions and by the initiatives of individual entrepreneurs. They have transformed American agriculture. Many of the entrepreneurs who have driven this transformation are still alive, and I have enjoyed the pleasure of listening to many of them while I was doing fieldwork for this book.

They have developed streamlined new organizational structures that reduce costs by

securing economies of scale, and they have centralized control of production, processing, and marketing. These complex new organizations require a high order of managerial skill, because the effects of mistakes are magnified, and a large operation can lose money faster than a smaller one. They have reduced the cherished independence of farmers, because many of the major decisions that control the activities of modern farms are made in distant corporate boardrooms rather than in the farmhouse kitchen or in the barnyard.

In 1949 most American farmers sought to be as nearly self-sufficient as possible. They did a little bit of everything to produce most of what they needed. They grew a variety of crops, some of which they sold, some of which they ate, but most of which they fed to farm animals. Tractors were replacing horses and mules, but most farms had a milk cow or two, fed out a few steers and pigs to be butchered after the first frost of fall, and kept a flock of barnyard hens to produce meat for Sunday dinner and eggs that the farm wife could collect and barter for "store-boughten" delicacies (fig. 1.1). In summer she sweated over a boiling cauldron preserving vegetables from the garden and fruit from the orchard for winter consumption. In 1949 the average American farm sold only $4,097 worth of farm products.

<fig. 1.1>

In 1997 the average farm sold products worth $102,970. (I rely heavily on the 1997 Census of Agriculture, even though rapid change has outdated a few parts of it, because it is our most up-to-date source of detailed and comparable geographical information for the entire nation, and it is consistent and comparable with censuses taken in earlier years.) Today most successful farmers have become specialists, and they are doing what their computers tell them they can do most efficiently and most profitably. They specialize in producing a single crop, maybe two, or a single type of livestock, and they buy everything else they need. Farmers and their wives stand in supermarket checkout lines just like the rest of us.

Specialization on producing a single commodity has spawned a new tripartite (core, periphery, and rimland) macrogeography of American agriculture. To show this new macrogeography I calculated the percentage of farm income derived from sales of crops in 1949 and in 1997 in each county that equalled or exceeded the national value of farm sales ($85 an

acre) in 1997 (fig. 1.2). In the midwestern heartland most counties gained more than five percentage points and shifted toward crops, because farmers in this area had changed from mixed crop-and-livestock farming to growing corn and soybeans for direct cash sale.

<fig. 1.2>

Counties in the periphery southwest and south of the midwestern core lost more than five percentage points and shifted toward livestock, because in the periphery entrepreneurs have developed highly specialized livestock operations that rely heavily on feed grains shipped from the core. The third major area is the rimland in California, in Florida, and in the Northeast, where most counties gained more than five percentage points, because farmers in these areas concentrated on producing vegetables, fruit, nursery and greenhouse products, and other highly specialized crops.

By 1997 most farms had gotten rid of their chickens and their milk cows and their hogs, but more than half of our farms still hung on to beef cattle (fig. 1-1). Small landowners and hobby farmers like beef cattle, which are a source of prestige rather than profit for their owners, because they prettify the place where the hobby farmer likes to play cowboy on weekends. The digestive systems of cattle enable them to eat grass and other roughages that are unsuitable for other forms of livestock. They require relatively little time, so anyone with a small acreage of land may be tempted to run a few head on it. Despite the ubiquity of beef cattle, however, most of our beef actually is produced by a small number of large feedyards.

Most farms that once could comfortably support nearly self-sufficient farm families today are too small. Farms have had to get bigger or go under. This thought offends some people, because the Jeffersonian ideal of small owner-operated farms that are self-sufficient is deeply embedded in the American psyche. The idea that a family farm must be small and self-sufficient has died hard, but nowadays a family farm is a business that must gross at least $250,000 a year in order to remain in business and provide an acceptable level of living for a modern American family.[1]

Farmers who grossed less than $250,000 from their farms in 1997 received a paltry return indeed for their labor after they had paid their bills for machinery, fuel, seed, fertilizer,

pesticides, feed for livestock, taxes, insurance, interest, utilities, and other farm expenses. Farming is no longer simply a way of life, although for many farmers it is still a very good life, and they would not swap it for any other. The old-fashioned, nearly self-sufficient, small family farm is a thing of the past. Perhaps the old folks can gradually tighten their belts and still manage to hang on to little one-person farms on land they have inherited, but the younger generation are not willing to make the sacrifices necessary, and they have forsaken the farm in search of a better livelihood and lifestyle.

A successful modern family farm is a complex business that demands a wide range of management skills. It is a specialized commercial venture with greater gross sales and a greater capital investment than most of the businesses on Main Street. It has had to get larger in order to stay in business, but 95 percent of the farms in the United States still are operated by families, although many of them have had to hire nonfamily labor as they have grown larger.[2]

The number of farms has declined dramatically. Many undersized farms simply have dropped out of production, especially in environmentally constrained areas in the Northeast and in the South, but much of their land has been incorporated into larger farms. The number of farms in the United States fell from a peak of 6.8 million in 1934 to 5.4 million in 1949 and then to only 1.9 million in 1997, but the nation's cropland only slipped from 478 million acres in 1949 to 431 million acres in 1997.[3]

Nearly two million farms still sounds like quite a lot, but if they were spread evenly across the country there would be only one farm for every two square miles, and they would be hard to find. In 1992 fewer than half of the counties in the United States, mostly in the Midwest, could boast that they had at least one farm per square mile, and only a few intensively specialized (e.g., tobacco, dairy, poultry) counties had two or more (fig. 1-3). Most of the West and large areas in the South and the Northeast had less than the national average of half a farm per square mile.

<fig. 1.3>

Furthermore, most of the nation's 1.9 million farms are superfluous to the contemporary agricultural economy, and they are included in the census only by virtue of an official definition

of a farm that is extremely generous: a farm, according to the U. S. census of agriculture, "is any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year." At least a million of the places included by this definition could not be considered real, honest-to-God farms by the wildest stretch of anyone's imagination.

In 1997 61 percent of all our "farms" sold less than $20,000 worth of farm products, but they produced a mere 3 percent of the nation's food and fiber (table 1.1). Half of all "farm operators" reported that they had off-farm jobs, and nearly half admitted that farming was not their principal occupation.[4] Operations such as these might properly be described as nonfarm farms, because they must have nonfarm income to support their farm activities.

<table 1.1>

Although the official census definition of a farm is extremely permissive, it should not be changed, because it has the great advantage of allowing the census to report a wonderfully complete and detailed accounting of the nation's agriculture. Even those of us who grumble about it would object vigorously to any proposal for making it less liberal. Simply remember that more than four-fifths of the "farms" included in the census are actually nonfarm farms, and they contribute little or nothing to the nation's agricultural economy.

The size of farms has increased. The number of farms and the size of farms are merely two ways of saying the same thing, because the size of farms increases when the number of farms decreases unless the acreage of farmland changes significantly. The average size of farms in the United States increased from 215 acres in 1949 to 487 acres in 1997 (table 1.2), while the number of farms was dropping from 5.4 million to only 1.9 million. National averages are inflated, however, by the large farms and ranches in the dry West, and east of the Missouri River the average farm increased from 115 acres in 1949 to 250 acres in 1997.

<table 1.2>

The total acreage of farmland also can be misleading, because much of the farmland of the West is rangeland of only limited agricultural value, and much of the farmland of the East is woodland of equally limited value. The acreage of cropland harvested is a better indicator of

productive agricultural land, and on the average farm in the East it nearly tripled, from only 46 acres in 1949 to 127 acres in 1997 (table 1.2).

Individual farmers have had many reasons for deciding to enlarge their farms. Increased specialization, greater commercial orientation, and technological innovations have forced them to grow larger to achieve economies of scale. Some new technologies, such as improved fertilizers and hybrid seeds, can be used on farms of any size, but many innovations require larger farms, because they have extremely high unit costs at low volumes of production but low costs at high volumes. For example, a $250,000 tractor (yes, there are such!) would cost $2,500 an acre on a 100-acre farm but only $25 an acre on a 10,000-acre farm.

Farmers have had to increase the volume they produce in order to stay in business. They have no control over the price they receive for their products, and when the price drops they can only maintain their income by reducing their costs or by producing more. They have watched their profits per head or per bushel shaved thinner and thinner, and they have had to produce more head or more bushels in order to stay in business.

The farm business has gone the way of the grocery business. Once nearly every corner had a small ma-and-pa grocery store that eked out a living by taking a high markup on a small volume of sales, but today the grocery business is dominated by supermarkets that make their profits from a large volume of sales with razor-thin markups, just as the farm business is dominated by large operations that produce huge volumes with tiny profit margins.

American agricultural production has become increasingly concentrated. In 1997 less than 4 percent of the farms in the United States produced 57 percent of our farm products, while 61 percent of the farms produced only 3 percent (table 1.1). One-third of a million farms that each sold more than $100,000 produced more than four-fifths of the nation's crops and animals, while the other 1.6 million farms did not contribute very much.

The concentration of production of individual crops and types of livestock is even more striking. The largest size category of farms producing most commodities includes fewer than one thousand farms, and these farms account for less than one percent of all farms producing that commodity, but they produce ten, twenty, even one hundred times their share (table 1.3). For

instance, 640 feedyards that sold 5,000 fed cattle or more produced three-quarters of our beef in 1997. Fed cattle are the extreme example of concentration, but laying hens and turkeys are not too far behind, and even the major field crops show a remarkable concentration.
<table 1.3>

The largest farm operations are massive. One thousand acres of corn or soybeans, for example, is four times the size of the average farm in the East, or more than six times the size of an original 160-acre homestead, and the scale of the largest livestock operations is equally staggering. Such huge operations demand an extraordinarily high order of managerial skill, and successful modern farmers, like other business men, must know how to obtain and manage capital, and how to keep the farm in the family, on top of everything else they need to know and be able to do.

A successful modern farm is a tightly integrated operation that cannot be broken up and partitioned among the heirs when its owner dies. One child must continue to operate it as a unit, and the other children are not willing to donate their inheritance to him or her, so family farms have been forced to incorporate to facilitate the transfer of assets from one generation to the next. Incorporation is simply a legal strategy for keeping the farm in the family when multiple ownership becomes necessary.

Some people have ideological and emotional objections to the very idea of corporate farms, and some states have passed laws to restrict them, but in 1997 only 4.4 percent of the farms in the United States were incorporated, and 90 percent of these were family-held corporations (table 1.4). Only eight thousand corporate farms were not family-held, and one-quarter were in California, Florida, or Texas. Nonfamily-held corporate farms are so heavily concentrated in the irrigated oases of the West that easterners cannot understand why westerners are concerned about them, and westerners cannot understand why easterners are not.
<table 1.4>

A family-held corporation can keep a farm operation intact after the death of its owner, but nonfamily-held corporate farms generally have not been too successful, because farms, and especially livestock farms, need the constant attention of an owner to a greater degree than most

other businesses, and it is hard to find managers who have the dedication of owners.

Crop farmers and livestock farmers have different needs when they enlarge the scale of their operations.[5] Crop farmers need to farm more land in order to increase their volume of production, but farmland has been too expensive for them to buy, and it has been too valuable for the owners to sell. Crop farmers thus have elected to enlarge their farms by renting land rather than by buying it, and they have invested their capital in the machinery wherewith to work it.

Livestock producers want to own the land before they invest in buildings, fences, watering ponds, loading and handling facilities, and other necessary structures. Many livestock producers do not need large acreages, because they can buy feed more cheaply than they can grow it themselves, and they house their animals in special purpose-built facilities, many of which look like conventional factories. These facilities are not cheap.

Livestock producers have been forced into new patterns of organization that have deprived them of some of their cherished independence. They are driven by the demands of meat-processing companies, who in turn are driven by the demands of consumers. Contemporary Americans are reluctant to spend time in their kitchens preparing food, and they are concerned about their health. They demand cuts of meat that are leaner, of predictably uniform quality, and in convenient ready-to-use packages. Processors are happy to satisfy this demand, because they make far greater profits from selling value-added products that have been specially prepared and packaged in plastic than they do from selling raw meat.

In order to manufacture standard products the processors must have a steady supply of animals of nearly identical size, shape, and quality. They have kept animal geneticists working overtime to develop prolific breeding stock that grow faster and produce leaner meat with less feed. Generally it is easier to produce these superior animals on large farms, because they require a greater capital investment and more specialized management. Furthermore, the processors prefer to deal with a few large producers, who can regularly deliver large numbers of standard animals, than with many small farmers, who deliver small lots of highly variable quality on an irregular and unpredictable basis.

Entrepreneurs have modernized meat production, which has six major stages: (1) growing the grain, (2) milling the grain into feed, (3) breeding the animals, (4) feeding the milled grain to the animals, (5) butchering the animals, and (6) selling the meat. Many years ago farmers did it all themselves, but grain farms, feed mills, feeding farms, processing plants, and marketing companies evolved into more-or-less separate firms as agriculture became more specialized and more commercially oriented.

Today the various stages have been pulled back together by vertical integration and streamlined into more efficient meat-producing systems called food-supply chains. A firm is vertically integrated when it takes control of two or more stages, whether by outright purchase of other firms or by contract with them. Feed mills, for example, have tried to increase their sales of feed by forward integration: they have contracted with farmers to feed animals for them, and then they have marketed the animals. Processors have integrated both ways: backward, by contracting with farmers to deliver the steady supply of animals they need to keep their production lines running, and forward, by developing marketing and distribution systems for their products.

The farmer who contracts with an integrator is expected to provide the facilities and labor. The integrator provides the animals and feed, supervises the farm operation, and handles processing and marketing. Farmers appreciate the income they are guaranteed by the integrator, but they resent being supervised on their own farms. Furthermore, the integrators prefer dealing with large farms, and many small farmers fear that integration will squeeze them out of business.

Gary Benjamin of the Federal Reserve Bank of Chicago undoubtedly spoke for many small farmers when he said that large producers are "cannibalizing" small farmers,[6] but the large producers retort that the small farmers are shooting themselves in the foot by refusing to accept and adopt modern technologies.

Vertical integration has become a dirty word in the minds of many farmers, because they associate it with the loss of their independence. The term has become virtually synonymous with large-scale modern livestock production, and those who are trying to halt the development of large new agricultural systems have seized upon it as a potent political weapon. They have

secured the passage of state laws forbidding it, and the integrators have been forced to find creative ways of circumventing these laws, or to move their operations to other states that are more permissive.

Different commodities are at different stages of the integration process. Broiler production, which led the way, was almost completely integrated by 1960, but turkeys were not integrated until around 1990. The integration of hog production started late but it is catching up rapidly. Packing companies have integrated vegetable production, but the major field crops, such as corn, soybeans, wheat, and cotton, do not lend themselves well to integration. The farmer sells most of them himself, although processors have contracted with some farmers to produce special crops, such as white corn grown for tortilla chips.

Vertical integration into food-supply chains is the way to the future of American agriculture, which entrepreneurs have transformed from a cottage industry into a streamlined modern system of food production. This transformation has forced most farmers to specialize in producing a single commodity, and it has forced them to enlarge their scale of operations. It has marginalized the "small family farm," which did many different things, none of them particularly well. A modern family farm must be an efficient business with gross sales of at least $250,000 a year in order to provide an acceptable level of living for a contemporary American family.

Table 1.1

Number of Farms and Value of Sales, By Size-of-Sale Categories, 1997

Value of Sales	Farms		Sales	
	Number	Percentage	($000,000)	Percentage
All sales	1,911,859	100.0	196,865	100.0
$500,000 or more	68,794	3.6	111,476	56.6
$250,000 to $499,999	87,777	4.6	30,505	15.5
$100,000 to $249,999	189,417	9.9	30,143	15.3
$20,000 to $99,999	390,785	20.5	18,806	9.6
Less than $20,000	1,175,086	61.4	5,934	3.0

Source of data: 1997 Census of Agriculture.

Table 1.2

Measures of Farm Size

	1949	1997
Average total acreage per farm		
United States	215	487
East	115	250
West	527	1,100
Average acreage of cropland harvested per farm		
United States	64	219
East	46	127
West	122	426
Average value of farm products sold per farm		
United States	$4,097	$102,970
East	$3,291	$90,700
West	$6,613	$123,841

Source of data: 1949 and 1997 censuses of agriculture.

Table 1.3Largest Farms, by Commodity, 1997

Commodity	Number of farms	Trait	Percentage of	
			Farms	Product
Fed cattle	640	5,000 sold	0.6	74.7
Laying hens	606	100,000+	0.8	65.9
Turkeys	868	100,000 sold	14.4	63.2
Sugarcane	58	2,000 acres	6.0	53.8
Hogs	2,462	7,500 sold	2.6	50.1
Cotton	3,173	1,000 acres	10.1	39.7
Vegetables	604	1,000+ acres	1.1	36.4
Potatoes	220	1,000+ acres	2.1	31.4
Orchards	614	1,000+ acres	0.6	28.6
Broilers	1,319	750,000 sold	5.5	26.4
Milk cows	878	1,000+	0.8	17.5
Soybeans	6,962	1,000 acres	2.0	16.1
Wheat	2,783	2,000 acres	1.1	14.2
Corn	6,535	1,000 acres	1.5	13.7

Source of data: 1997 Census of Agriculture.

Table 1.4

Number of Farms and Corporate Farms in Selected Areas, 1997

		Corporate Farms	
	All Farms	Family-held	Other
United States	1,911,859	76,103	7,899
California	74,126	4,473	779
Florida	34,799	3,881	635
Texas	194,301	4,659	610
Iowa	90,792	5,733	395
Illinois	73,051	2,790	253

Source of data: 1997 Census of Agriculture.

Insert New Tables for Ch 1 (2) [NEW TABLES FOLLOW]

Table 1.1

Sales of Farm Product, By Value of Sales, 2002

	Farms		Sales	
Value of Sales	Number	Percent	($000,000)	Percent
All sales	2,128,982	100.0	200.646	100.0
$500,000 or more	70,642	3.3	124,204	61.9
$250,000-499,999	81,694	3.8	28,530	14.2
$100,000-499,999	159,052	7.5	25,402	12.7
>$100,000	1,817,594	85.4	22,511	11.2

Source: 2002 Census of Agriculture

Table 1.3

Largest Farms, By Commodity, 2002

Commodity	Trait	Number of Farms	Percentage of Farms	Percentage of Products
Hogs	7,500+ sold	5,021	6.1%	74.1%
Fed cattle	5,000+ sold	684	0.6	73.4
Turkeys	100,000+ sold	800	9.5	65.3
Laying hens	100,000+	373	2.0	65.2
Sugarcane	2,000+ acres	82	8.6	58.2
Cotton	1,000+ acres	3,458	13.9	49.1
Potatoes	1,000+ acres	279	3.0	48.0
Vegetables	1,000+ acres	553	1.0	36.2
Broilers	750,000+ sold	2,211	6.9	32.0
Milk cows	1,000+	1,256	1.4	28.8
Orchards	1,000+ acres	586	0.5	28.3
Soybeans	1,000+ acres	10,385	3.3	21.2
Corn	1,000+ acres	8,902	2.6	20.9
Wheat	2,000+ acres	2,586	1.5	14.9

Chapter Fifteen

Conclusion

At the dawn of the twentyfirst century entrepreneurs were transforming American agriculture from a cottage industry into an efficient, modern, streamlined, and ever more tightly integrated system of largescale food supply chains linking producers with processors and retailers. The consolidation of smaller units into larger units, whether producers, processors, or retailers, has achieved impressive economies of scale that generate better food at cheaper prices for consumers. The share of the consumer dollar spent to buy food dropped from 21 cents in 1950 to only 11 cents in 2000.

American consumers have driven this transformation. We assume that the shelves of our grocery stores will be well stocked with food we can afford. We take for granted an awesomely elaborate and efficient food distribution system that moves thousands of food products from millions of farms to the shelves of 127,000 grocery stores. This system draws food from all over the globe, as a stroll through the fresh fruit and produce aisles of any supermarket will easily demonstrate.

Americans want food that we think is nutritious, healthy, and good for us, and we expect it to be free of dangerous chemicals and pathogens. We want food that is convenient and ready to eat, or at least ready to pop into the microwave, because we are reluctant to spend time preparing it, and we like to eat out. We spend 40 cents of our food dollar in restaurants and other convenient eating places, and supermarkets have added prepared food and takeout counters to compete with them. We expect the quality of our food to be consistent, and we are willing to pay premium prices for reliable brands we have learned we can trust.

Some people are concerned about the conditions under which their food is produced, and they seek assurance that farmers have been as kind as possible to their land, to their livestock, and to their labor. They are concerned about pollution of water and air by farm operations. They are concerned about the welfare and humane treatment of farm animals. They are concerned about the use of chemicals and biotechnology to enhance the growth of crops and animals. They

are concerned about the working and living conditions of farm workers, and the wages they are paid. Like everyone else, they express their concerns at the checkout counter.

Food-supply Chains

All of us, whether we realize it or not, send signals loud and clear to supermarkets when we buy barcoded food. The bar codes tell the supermarket computer what we buy, when, and how much. The supermarket uses this information for inventory control, and its ideal is to save warehouse costs by placing items on its shelves justintime, just before we enter the store to buy them.

The consolidation of small retail grocery stores into large supermarket chains has concentrated the buying power of the chains, and they have used their economic muscle to dictate to the food processors who supply them. Instead of meekly taking whatever the processor has to offer, they tell the processor what they will buy, because they know their customers want it, and they have pushed the cost of warehousing back onto the processor.

The barcode scanner at the checkout counter in the supermarket tells the store's computer that the supply of an item is running low. The store computer sends a signal to the computer in the processor's warehouse, which prints out a resupply order to the driver of the delivery truck, who is the first real live human being who even knows about the transaction, which means a significant saving in labor costs.

Food processors have had to satisfy the demands of supermarkets for healthful, convenient, consistent products, and they have transmitted these demands of consumers back down the foodsupply chain to the farmers who produce the commodities they process. Processors have closed down their small, old, highcost plants, and they have consolidated their activities in fewer, larger, more efficient new factories. The closure of small old processing plants deprives farmers of some of their options for selling their commodities. In 1975, for example, the state of Minnesota had 86 butter and cheese plants where dairy farmers could sell their milk, but the number had dropped to 44 in 1985 and only 20 in 1998, and not a single new

plant had been built since 1968.

Food processors have located their new plants in the rural areas that produce the commodities they process, where land and labor are cheaper. They have cut their high labor costs by breaking down their processes into simple easy tasks that lowskill workers can perform, but they have had to recruit large numbers of lowskill workers, many of them immigrants, to do unpleasant work. The influx of large numbers of immigrant workers has created serious social problems in the rural areas where the new plants are sited.

The new processing plants must operate at full capacity to achieve their maximum efficiency, and they must have a steady and reliable supply of the commodities they process. A meatpacking plant, for example, cannot afford to adjust its machinery for each new truckload of animals. It would rather contract with a few large producers who can deliver a regular supply of uniform animals instead of having to dicker with large numbers of small independent farmers who deliver an irregular supply of heterogeneous animals when they feel like it.

Farmers must enlarge their scale of operations to produce what processors and retailers need, and those who fail to link into a foodsupply chain will have difficulty staying in business. They no longer enjoy the luxury of being able to produce whatever they like, taking it to market, and assuming someone will buy it. They must choose between controlling all of a small and probably faltering business, or becoming part of a larger business organization.

Modern farmers, who are not willing to accept a lower level of living or a poorer lifestyle than city people, realize that the profit in farming today lies not in producing commodities, as in years gone by, but in adding value to commodities by processing them into products. They are full well aware that the farmer's share of the consumer's food dollar dropped from 33 cents in 1970 to only 20 cents in 2000, and the rest goes to pay for processing, packaging, transportation, and marketing.

Successful modern farmers must tap into these sources of valueadded profits by developing formal contracts with processors and retailers, even though these contracts will cost them some of their cherished independence. Some small producers have tried to retain some of their independence by forming cooperative alliances that will give them greater power in

bargaining with processors, but most farmers have had to enlarge their scale of operations in order to stay in business.

Enlarging the scale of farm operations should generate economies of scale and reduce costs of production. The lowestcost producer never has to worry about the price of the commodity, but increasing scale also increases risks. Largescale production requires large amounts of capital and labor, and the ability to acquire and manage them as skillfully as crops and livestock. The largescale producer must do almost everything right almost all of the time, and has precious little margin for error.

Some small producers have been able to retain their independence by identifying and serving specialized niche markets for products such as organic foods, exotic vegetables, and the like. Niche production requires highly specialized knowledge of marketing, however, and if it succeeds it risks attracting too many producers, who may destroy the market for everyone by producing an oversupply.

Entrepreneurs and Communities

The people who have transformed American agriculture have been entrepreneurs. They have believed in themselves, and they have been willing to take great risks, albeit risks they have calculated with minute precision. They have been charismatic leaders who have been able to identify, hire, and inspire dedicated lieutenants. They have demonstrated the ability to grow a oneman band into a rational and orderly business organization of closely collaborating specialists.

Many entrepreneurs have problems of succession. Their children have grown up in an atmosphere of everincreasing affluence as their parents have prospered. The children are quite willing to spend the money their parents have made, but they have never had to learn to work as hard as their parents had to work. Good entrepreneurs must be clever or wise enough to know when to hire a professional manager to run the business, or when to sell it.

Selling the business in which they have invested their entire lives can be traumatic for the

entrepreneurs, and it can be equally traumatic for the business. The original entrepreneurial business is a highly personal affair, and the entrepreneurs see their producers and clients in church on Sunday as well as on their farms during the week. When the original owner sells a business the good old boy atmosphere of mutual trust and friendship may be replaced by a coldeyed, cutthroat, corporate culture that worships only the bottom line and cares nothing about people. Aggressive young Masters of Business Administration move in and take over, and their style can quickly turn the business into a less pleasant place to work and do business.

Many entrepreneurs have problems of success as well as succession. Their less successful neighbors often envy them, and longstanding feuds have exacerbated. The increasing size and decreasing number of farms have decimated the population of rural areas. Some large farms are absenteeowned. Many are accused of taking their profits out of the community because they do not patronize traditional local businesses, but they may spawn successful new businesses with their needs for specialized consultant support and advisory services ranging from crops through agrichemicals to nutrition, animal health, custom machine work, accounting, and global positioning systems.

Large farms and rural depopulation often are blamed for changes that actually were triggered by Henry Ford and his Model T. Affordable automobiles enabled rural people to travel far and wide in search of the goods and services they needed, and the Main Streets in small central places that serve rural areas have been losing businesses for nearly a century, but so slowly that many people fail to understand that they have long since lost their original reason for existence. The idea of rural areas comprised of tight sixmile communities is a hangover from the horseandbuggy era.

Some people complain that entrepreneurs and their large farms are oversubsidized. On May 14, 2001, the New York Times (p. A10) reported that the top 10 percent of American farmers received 61 percent of all federal farm subsidy payments, but added that "8 percent of the country's farms produce 72 percent of the country's harvest," which says that the largest farms actually receive less than their share of farm subsidy money, even though their risks are greater. Too many small inefficient farmers would rather blame others and seek scapegoats

instead of accepting responsibility for their own inadequacies. These are the kinds of farmers who complain bitterly about their taxes when they enjoy a good year, and then squeal for a government bailout when they suffer a poor year.

Too many politicians seem unable to put such complainants in proper perspective. Perhaps it is socially desirable to spend public dollars to subsidize undersized farms that are inefficient and uneconomic, but it seems unjust for farm programs to discriminate against successful farmers by capping the amounts of subsidy dollars they may receive.

The New Tripartite Macrogeography

The transformation of American agriculture has rewritten the agricultural geography of the United States. The nation now has a cashgrain core in the agricultural heartland in the Midwest, specialized livestockproducing areas around its peripheries, and specialized cropproducing areas in the rimland (fig. 1.2).

Farmers in the agricultural heartland have shifted from mixedcropandlivestock farming to largescale production of corn and soybeans, feed grains they can sell directly for cash instead of feeding them to animals. Some farmers in the heartland capitalize on the ready availability of these highenergy crops by specializing in livestock production, but livestock feeding has lost its erstwhile preeminence in the region and has shifted to its peripheries.

Unit trains and Interstate highways carry enormous quantities of highenergy feed grains from the heartland to the peripheries, where entrepreneurs have developed modern largescale livestock operations that specialize in producing a single commodity. The spotty distribution of these new livestock operations reflects the decisions of entrepreneurs, because they have not been developed in other areas that seem just as suitable as the areas in which they have been developed.

Largescale production of cattle and of poultry and pigs developed along two parallel tracks, with much interchange of ideas and technology between tracks. Largescale feedyards for beef cattle, which are concentrated on the southern High

Plains in Kansas, Oklahoma, and Texas, use open drylots. Beef producers were early in starting largescale production, but subsequently the beef industry has lagged, because it has not been able to standardize and deliver a consistent reliable product. Beef feedyards are at the mercy of many small independent cowcalf producers, who keep cattle for pleasure and prestige as much as for profit, who like exotic genetics that produce a wildly heterogeneous variety of feeder animals.

The first largescale dairies near Los Angeles adopted a modified version of the open drylots used by beef feedyards. The dairy producers who have been displaced by urban encroachment have transplanted their operations to the Central Valley, Texas, Idaho, and other parts of the United States, where they are more likely to house their cows in long, onestory, curtainsided structures similar to those used for poultry and pigs. In the traditional dairyfarming areas of the East producers have lagged a bit in adopting modern largescale technology.

Broiler producers in northeast Georgia and on the Eastern Shore were the first to develop a true modern system of largescale food production, with foodsupply chains that stretch from genetics to grocery store, and deliver convenient healthy food of consistent high quality at attractive prices. Broiler production has become widespread throughout the South, and chicken has gained market share at the expense of beef, to become our leading meat.

Turkey and egg producers have emulated the broiler model, and they house their animals in purposebuilt structures that look like broiler houses. The maps of the distribution of turkeys and of laying hens are the best examples of maps that show entrepreneurial patterns. Laying hens especially are ubiquitous throughout the East.

Pig production was the last major form of livestock production to be modernized in the United States. Wendell Murphy started the process in eastern North Carolina, which has become the nation's second leading pigproducing state. Entrepreneurs have developed new centers of production in Missouri, Oklahoma, Utah, and other widely scattered areas, and in the Corn Belt pig production has shifted toward northern Iowa and southern Minnesota.

Pig production has been modernized in an era of heightened environmental sensitivity, and pigs are the most malodorous form of livestock, because their waste smells so much like human waste. The stench of the new pig farms gave environmental activists an easy weapon

with which to attack them, and pig producers seem to have jumped from state to state in pursuit of the most permissive environmental regulations. We need national environmental standards to reduce unhealthy competition between states to recruit undesirable facilities.

On the nation's rimland the production of specialized crops has become more important. Vegetables have given way to nurseries and greenhouses on the fringes of Megalopolis, and vegetable production has migrated to New Jersey, to the Eastern Shore, to Florida, and finally to California, whose largescale producers compete to place fresh vegetables in every supermarket in the United States. In the Southeast cotton has made a dramatic comeback, and Florida now has extensive citrus groves in areas that were considered unsuitable for citrus before the Great Freeze of 1985.

Sweeping changes, such as those that are transforming American agriculture, offer great opportunities, but they also have serious adverse consequences. They beget losers as well as winners, and some producers will suffer while others prosper. Some people fear change, and try to halt it by political means, but they will be no more effective than the legislator who proposed a law to change the value of pi to an even 3.0 because he could never remember 3.14159265.

Change is inevitable, and it is foolhardy to try to halt it. Somebody somewhere is going to use new technology as soon as it becomes available, and no individual, no state, no nation is going to be able to force the genie back into the bottle once it has emerged. No country can long support domestic prices above the world price of a commodity, as the United States learned to its sorrow when it tried to protect the price of cotton, but some ignorant politicians still seem to think that we can maintain and protect an artificially high domestic price for other crops.

Change is global. The best equipment for egg houses is made in Germany. The best swine genetics were developed in England and are licensed to producers in the United States. Manufacturers in Europe have developed competitive technology for producing, processing, and packaging other agricultural commodities. As Gary Allen said to me, "In Minnesota agriculture our competition is no longer the guy down the road. In dairy it's California or Idaho or New York. In hogs it's Iowa or North Carolina or Chile, and in beef and soybeans it's Brazil."

The future of American agriculture is in the hands of those who realize that they must

embrace change instead of trying to halt it, the entrepreneurs who have learned that they need to add a zero or two to the way they think about farming. The farm that seems large in 2002 will seem small in 2022.