

# The Transformation of American Agriculture

During the second half of the 20th century entrepreneurs have transformed American agriculture from a cottage industry, with myriads of small farmers doing many different things, but none of them particularly well, into a highly specialized system of large-scale food production (Hart 2003). Individual farmers have become specialists in producing only the commodities their computers tell them are most profitable and competitive, and they have greatly enlarged the scale of their operations.



Photo: R. Jungst

Photo 1: The Corn Belt has become a vast field of soybeans and corn

**F**or example, most farmers in the Corn Belt have shifted from mixed crop-and-livestock farming to cash-grain farming (Textbox and Photos 3a/b). They have gotten rid of their hog and cattle operations, and specialize in growing crops of corn and soybeans, which are shipped to specialized livestock producers in the South and West (Hart 1986). They have con-

verted the entire Corn Belt into a vast field of corn and soybeans (Figure 1 and Photo 1).

The entire business of food production is consolidating into tightly organized supply chains, just as the steel business and the automobile business consolidated in years gone by. Consumers have driven this consolidation, by way of the point-of-sale bar code and

the computer. Barcode readers tell grocers what their customers are buying, when, and how much. Computers give grocers such tight control of their inventories that some are aspiring to just-in-time management; products will be delivered to their loading docks just before the customer walks into the store to buy them.

Grocers have learned that their customers want to buy products they consider healthy. They have learned that their customers want to buy products that are convenient and "microwave-ready," such as ready-mixed salads in plastic bags, because contemporary Americans are reluctant to spend time in their kitchens preparing food. Grocers have learned that their customers are willing to pay premium prices for reliable products, and they will pay more for brands they know they can trust.

Grocers transmit these desires to the processors who supply them. Grocers need a steady supply of reliable standard products, and it is easier for them to deal with a few large processors instead of having to dicker with large numbers of small processors who deliver products of highly variable character. Small local processors have diffi-

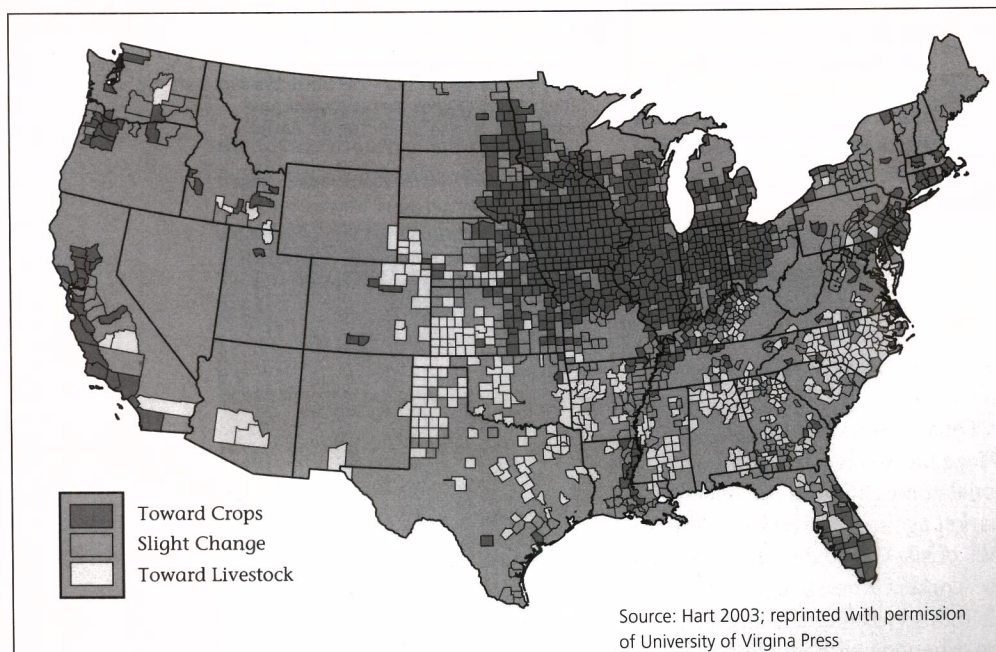


Figure 1: Since 1949 the Midwest has shifted toward crop production, and the periphery has shifted towards livestock

culty satisfying the massive requirements of large regional and national grocery chains, and as the chains have grown larger they have been able to exercise ever greater power over their processors.

The processors, in turn, tell producers what they must have in order to keep the grocers happy. The producers are the farmers who produce commodities, such as grain, cattle, hogs, chickens, eggs, milk, potatoes, vegetables, and fruit. The processor buys these commodities from the farmer and adds value to them by fashioning them into products that grocers sell to their customers.

The processor must have a steady supply of standard commodities from producers, because the efficient operation of a modern processing plant requires a steady supply of suitable raw material. For example, a meatpacking plant is inefficient if it has to adjust its machinery every time a new truckload of animals pulls up to its loading dock. Like grocers, processors would rather deal with a few large producers who can deliver large lots of uniform quality on a regular basis than with many small producers who deliver mixed lots of heterogeneous quality whenever they happen to feel like it.

The distinction between processing and producing has become blurred, especially in livestock production, because processors have learned that they must actively aid

and incite producers to deliver the quality that consumers demand. Meatpackers have learned that they must take charge of the entire production system, from genetics to grocery store, by integrating it vertically. They must superintend the genetics to ensure animals that are uniform, and they have made a few breeds of hogs, chickens, and turkeys predominant throughout their entire industries. The integrator also must supervise the way farmers feed the animals to ensure their quality.

Vertical integration of livestock production began in the broiler business (broilers are chickens less than ten weeks old). The broiler integrator has mills that produce feed and hatcheries where the eggs are laid and incubated. The integrator delivers day-old baby chicks to farmers, fills their feed bins twice a week, and pays them a set fee to feed the birds to market weight. Then the integrator collects them, hauls them to the plant to be processed, and brands and markets the meat.

Vertical integration has converted chicken from a luxury into the cheapest and most popular meat in the United States, but the term has acquired an unfavorable connotation, because some farmers grumble about the control the integrator exercises over them on their own farms, although they like the guaranteed income, and most integrators have waiting lists of

farmers eager to sign up with them. Some vertically integrated livestock production systems now are called "food-supply chains," and this euphemism apparently is less subject to criticism, even though the production system remains the same.

Vertical integration has helped to consolidate agricultural production in the United States in the hands of a remarkably small number of large producers (*Table 1*). In 2002, for example, 82,028 American farmers sold hogs, but a mere 5,021 (6.1% of all hog farmers) produced three-quarters of the national total. Production of other agricultural commodities is similarly concentrated in the hands of a small number of producers, and these producers are concentrated geographically. Most modern livestock producers are within 27 miles (=50 km) of the feed mills and processing plants of integrators, and they keep the animals in confined feeding operations on small plots of land.

## Poultry

Before World War II most American farms had a barnyard flock of chickens for eggs and for Sunday dinner. The farm wife sold any surplus eggs for pin money, but few farmers tried to produce chicken commercially, because the price was too volatile, and the business was too fragmented. The hatchery, the feed mill, the farmer, the processor, and the marketer each had to make a profit, and for each the margin was precariously slim.

After the war entrepreneurs began to integrate all of these profit points into single companies that could smooth out volatility by dealing with many producers, pool the profits, and even reduce their taxes by creative internal reallocation of funds. The vertical integration of broiler production began in northwestern Georgia, in northwestern Arkansas, and on the Eastern Shore of Chesapeake Bay in Maryland, Virginia, and Delaware, but it has become ubiquitous throughout the South. Each cluster of broiler farms is

Table 1: Largest farms in the U.S. by commodity, 2002

Commodity	Trait	Number of farms	Percentage of	
			farms	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 %
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 %

\* 1,000 acres = 405 hectare/ha

Source: 2002 Census of Agriculture

within easy hauling distance of a complex consisting of the integrator's hatchery, feed mill, and processing plant.

The integrator contracts with farmers to feed baby chicks to market weight of around 4.4 lb. (2 kg), but it handles the rest of the business itself. It requires the farmer to build broiler houses to its specifications, and it supervises his operation. The first broiler houses were small, but they have gradually gotten larger, and a contemporary 40-by-400 ft. (12-by-120 m) broiler house holds 22,000 birds. The lower half of the sidewalls is solid, but the upper half has a heavy curtain that can be opened or closed depending on the weather.

One end of the broiler house has a pair of large corrugated metal grain bins (one is always kept full) with bottoms that taper to serve the automatic feeding system that runs the entire length of the house, which also has automatic watering and heating systems. Any heavy lifting can be done morning or evening, and the house needs little attention during the day, so the broiler farmer can easily manage to hold an off-farm job.

The turkey business eventually followed the lead of the broiler business, and turkey production in the United States has become completely integrated (*Photo 4*). Turkey houses are indistinguishable from broiler houses, and the turkey map has the same clustered pattern as the broiler map, although turkeys are produced more extensively in the North. The turkey map is especially intriguing, because a knowledgeable person can identify the entrepreneur who was responsible for creating each of its clusters.

## Hogs

Hog production was the last major form of livestock production to be consolidated in the United States (*Figure 3*). As late as 1980 most American hogs were produced on dirt lots by small farmers in the Corn Belt. Some managers were better than others, but meatpackers complained that they had to

cope with a heterogeneous mix of all breeds, sizes, and shapes of hogs.

*Wendell Murphy*, of Rose Hill in eastern North Carolina, was the entrepreneurial genius who revolutionized hog farming in the United States, and he did so almost by accident. He owned a feed mill, and his sales were lagging, so he tried to increase sales by buying hogs and contracting with local farmers to feed them. His timing happened to be exquisite, and his hog business blossomed so prosperously that he stopped selling feed, concentrated on contracting for hogs, and soon became the nation's leading hog producer. Some of his neighbors followed his lead, and by 1997 they had moved North Carolina ahead of Iowa as the leading hog producing state in the United States.

*Murphy's* first contractors fed their hogs on traditional dirt lots, but as he prospered he began to emulate broiler producers and required his contractors to build curtain-sided barns for their animals. A standard 1,000-sow hog farm (*Photo 5*) has a breeding barn, a gestation barn, a farrowing barn, and a nursery on one side, and on the other are ten 41-by-148 ft. (12.5-by-45 m) finishing barns that each hold 1,000 hogs in pens of 25.



Photo 4: Young turkeys in a turkey house

The piglets stay with their mothers until they weigh five to seven kilograms, move to the nursery barn until they weigh 55 lb. (25 kg), and then go to one of the finishing barns until they reach market weight of 275 to 330 lb. (125 to 150 kg) at an age of five-and-one-half months. In each barn the animals receive the specially designed feed that is ideal for their age and weight.

Hog producers must be singularly sensitive to biosecurity, because one single germ could wipe out their complete enterprise, so the entire building complex is enclosed within a chain link fence. The only entrance is through a locker room, where everyone

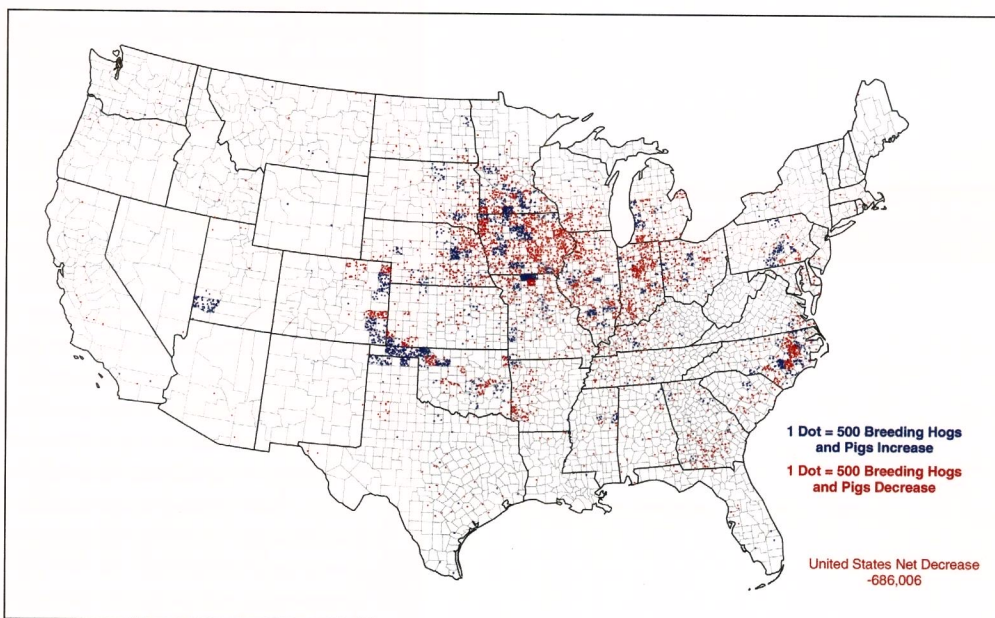


Figure 3: Hogs and pigs used or to be used for breeding – change in inventory 1997 to 2002

Source: U.S. Agricultural Survey; [www.nass.usda.gov/research/atlas02](http://www.nass.usda.gov/research/atlas02)

must shower, wash their hair, and change clothes when entering or leaving. "You shower when you enter because you have to, and you shower when you leave because you want to."

Hogs eat like hogs, and they produce four times as much solid waste as people. A farm with 10,000 hogs produces as much solid waste as a city of 40,000 people, and manure management is a challenge. Initially hog farmers managed their waste in the traditional fashion, by flushing it into storage basins, euphemistically



Photo 5: 1,000-sow hog farm



Photo 6: Curtain-sided dairy barn for 700 cows



Photo 7: 50,000-head feedyard west of Dodge City, Kansas

known as "lagoons," and spreading it on fields and pastures as fertilizer. Many hog farms have enough pasture to support small prestige herds of beef cows.

Lagoons stink! There can be no question about it, even those who have them must admit that hog lagoons stink to high heaven, and they have been an easy target for critics of the large new hog farms. Furthermore, a few badly constructed lagoons have burst and flooded nearby streams with great solid slugs of hog manure, and some critics think that the lagoons might pollute groundwater, although as yet they have no convincing evidence.

In newer hog producing areas farmers have developed less noisy systems of waste management, but the sheer size of the new farms offends many people. Entrepreneurs have emulated the *Murphy* model in Utah to be closer to the markets on the Pacific Rim, on the Oklahoma Panhandle, where a financier has invested half a billion US\$ in developing a completely new area of hog production, and even in some of the more traditional hog producing areas in the Corn Belt.

## Dairy

The modernization of dairy production began in Los Angeles, which in 1940 had many "town dairies" that bought their feed, milked a few cows in a shed behind the house, and sold the milk from a roadside stand in front. After the war many of these producers sold their properties for very advantageous prices and developed larger new dairy operations in outlying areas. They kept their cows on "dry lots," which were merely exercise areas, marched them to milking parlors two or three times a day, and fed them alfalfa hay trucked in from irrigated areas in the deserts to the east.

This new system culminated in the Chino area, 31 miles (50 km) east of downtown Los Angeles, which once had the

world's most awesome assemblage of dairy cows. At its peak around 1990 30 square miles (80 km<sup>2</sup>) in the Chino area had 375 dairies with an average of 620 cows on 40 acres (16 hectare = ha) of land, but today even the Chino area has given way to urban encroachment, because developers have bought the land at prices of US\$ 600,000 or more per ha, which seem astronomical to farmers and astonishingly high even to city folk.

Urban encroachment actually is the best thing that could have happened to Chino dairy farmers, because it transferred urban capital to cash-short farmers, and enabled them to develop large new state-of-the-art facilities in other areas (*Sterngold* 1999). Bought-out dairy farmers from Chino have started new dairy farming areas in the Central Valley of California, in southern Idaho, and in Arizona, New Mexico, and Texas.

Dairy farmers in the traditional dairy belt, which runs eastward from Minnesota to the Atlantic Ocean, have lagged in adopting the new technology, and they are under great stress. Only a handful have accepted it and enlarged their operations. They keep hundreds of cows in long low buildings that are curtain-sided because of the climate (*Photo 6*), and they milk them in central parlors that can handle 50 to 60 cows at a time. Much of their hired help is Mexican.

Traditional dairy farmers have been too comfortable, complacent, and conservative. They are struggling to survive on under-sized farms. They complain about the low price they get for their milk, and are reluctant to admit that their cost of producing it is too high. Dairy experts say that a modern dairy farm must milk at least 500 cows to provide an acceptable level of living for a contemporary American family, and the larger operations are milking up to 10,000. In 2002 the average dairy farmer in California had 600 cows, but in the old dairy belt only 75. Many dairy farmers have stopped milking, taken off-farm jobs, and down-

shifted to rearing beef cattle. The traditional 40-cow dairy farm, which for so long was the mainstay of the dairy belt, has gone the way of the dodo.

## Beef

Beef cattle are the paradox of modern American agriculture. The beef business was first to develop large-scale feeding operations, but modernization has stalled because too many small and ruggedly independent producers rear beef cattle. Most of the nation's beef cattle are reared in environmentally constrained (dry or hilly) areas (Hart in press). Before 1970 most were shipped to the Corn Belt to be fed to market weight in small farm feedlots, where feeding cattle was a sideline activity. After harvest Corn Belt farmers calculated how much corn they would need to feed their hogs, and if they had any surplus they bought lean feeder cattle.

Warren Monfort of Greeley, Colodaro, 62 miles (100 km) north of Denver, was the entrepreneur who pioneered modern large-scale cattle feeding after World War II. He bought all of his feed from farmers and produced better beef more cheaply by specializing in feeding cattle in large open feedyards (Photo 7, see also Map Insert in this issue). The Colorado Piedmont remains a beef-feeding area, but after 1970 the business began to shift from the Corn Belt to the Texas Panhandle and southwestern Kansas, where deep wells were tapping the Ogallala aquifer to serve center-pivot sprinkler irrigation systems that produced huge quantities of feed crops such as sorghum, corn, and alfalfa.

In Texas and Kansas entrepreneurs built huge feedyards with capacities of 50,000 head or more that are divided into corrals that hold around 400 head each. The feedyards are dominated by towering elevators for storing grain, and next to them are the squat mills in which it is converted into feed. Self-unloading trucks dash back and forth from the feed mill to fill

the feed troughs that line the sides of the corrals.

The meatpacking business, which once was concentrated near the stockyards at major railroad terminal centers, has migrated to the feedyards. The old packing plants shipped whole carcasses, and every grocery store had to employ its own butcher at high wages, but the new plants sell "boxed beef" in standard cuts ready for direct sale to customers.

The feedyards can feed only cattle that producers send to them, and they are severely handicapped by the excessive fragmentation of cattle rearing. In 2002, 796,436 farmers and ranchers in the United States had herds of beef cows, but only 163,626 had 50 cows or more, and the rest were small hobby herds. Anyone with a few acres of grass can run beef cows on it. Many cattle are little more than lawn ornaments that give their owners the prestige of playing cowboy on weekends, and quality and profit are incidental. Beef cows of dubious quality grazed on pastures of dubious quality produce lean beef animals of dubious quality, and feedyards can do only so much to upgrade the quality of the truly weird melange they receive. Beef is the most unpredictable meat in the American grocery store, because cattle rearing in the United States has not yet been consolidated and modernized.

## Conclusion

The transformation of American agriculture has extended to other forms of production. Three growers in the Salinas valley of California, the nation's leading vegetable-producing area, illustrate the scale of change (Hart 2003, pp. 251–256). The Mann Packing Company, which also has winter operations in Arizona, harvests and markets 247 acres (100 ha) of broccoli every week of the year. Tanimura and Antle double-crop 17,500 acres (7,000 ha), package their crops in the field when they harvest them, and sell ready-to-eat salad packages as far east as Florida. The D'Arrigo Brothers

grow vegetables on 30,000 acres (12,000 ha) and harvest two-and-one-half crops a year, a greater acreage of vegetables than is harvested in the entire state of New Jersey, which likes to boast that it is "The Garden State".

The continued consolidation of American agriculture seems inevitable, and farmers must continue to enlarge their scale of operation. Many small farmers are struggling to find niches for themselves where they will have a competitive edge, and some will undoubtedly be successful, but some will not. Many have high hopes for organic production, and they boast about how rapidly it is increasing, but a large percentage increase from a small base still is not very much.

Continued consolidation seems inevitable because producers are giving Americans better food and cheaper food. The share of disposable personal income that is spent for food in the United States declined steadily from 23% in 1950 to only 10% in 2000, and most Americans are worried about being overweight, which suggests that they already have more food than they should eat. ■

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