

Agricultural Industrialization: For Better or Worse?

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Economics shocks buffeting the Wisconsin dairy industry are not unlike those afflicting agriculture for decades and even centuries. Agriculture historically has been beset more than most industries by shocks from nature, technology, and markets. Such shocks particularly from technology and markets have created winners and losers. Farm winners have gone on to earn favorable returns on resources, create the most productive agriculture on earth, and provide a good life for operators and their families. Winners have provided the world with low cost, abundant food supplies of high quality and variety, and earned foreign exchange to pay for oil and other imports.

Forces of technology and markets, unfortunately, also have left behind many hired farm workers, farm operators, and families. Some of those people have remained in farming while experiencing hardships; others have found better economic opportunities outside of farming.

The process of structural change in American agriculture began with the commercialization of agriculture soon after the Jamestown colony was settled in Virginia in 1607. Colonists bought inputs and sold tobacco to “strangers” in England through markets farmers did not control or understand. As early as 1630,

Virginia colonists attempted legislative price-fixing and acreage controls on tobacco in response to perceived unfairly low prices (Taylor, p. 21). After voluntary controls failed, rioting Virginia tobacco growers engaged in plant-cutting and destruction of tobacco to raise prices. Thus began this nation’s long history of farm discontent, occasionally violent protests, and populist political movements (Taylor; Tweeten 1979, Ch.3).

Despite protest movements, American farmers have not wavered in their commitment to private enterprise (Tweeten 1979, Ch. 3). When “good” markets failed, farmers were unwilling to accept that setbacks were the result of impersonal, normal forces of technology, supply, and demand. Rather, the failure of “good” markets and “good” farmers could only be the result of conspiracy by merchants, bankers, foreign governments, or “middlemen” extracting excessive profits.

These farm protesters were not Marxist revolutionaries determined to overthrow democratic-capitalism or passive yeoman speculators who asserted that downside risks were inevitable “heat in the kitchen.” Rather the pervasive alternative agriculture culture has been populism—the philosophy that there is a

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simple, appealing, and wrong solution to every complex farm problem.

The purpose of this paper is to review briefly structural changes underway today in American agriculture, their causes, and the public policies underlying change. I explore whether the current system is performing well, and how public policy might be improved to better serve producers and consumers.

Before proceeding, I state some of my value judgments. I believe the main purpose of the political-economic system is to improve the well being of people. Economic development presents people with options from which they can choose to better their life. Development proceeds through economic efficiency (more output per unit of inputs of land, labor, and capital), equity (providing distributive justice by access to schooling, a safety net of basic, social needs, etc.), and freedom of individuals to make decisions that improve their well being, as long as rights of others are respected. I feel these are best served by free enterprise in a democratic system where the public sector provides public good and corrects externalities so that markets work well. These issues are addressed in more detail later.

Industrialization of Agriculture

Major structural changes occurring particularly in the livestock industry today are commonly referred to as the industrialization of American agriculture. It refers to the application of modern manufacturing production, distribution, and coordination methods to the food chain (Boehlje, p. 30). Distinctive features include movement to fewer, larger farms (of which some are

“factory” farms), to vertical coordination, and to other departures from the traditional family farm where the operator and family provided over half the labor, management, and equity capital.

Industrialization of dairy and other farming enterprises is caused mainly by changes in technology and organization underway for some decades. Previous highlights included the milking machine and the tractor and its complements replacing labor and bringing larger and fewer farms especially in the 1940s and 1950s, and disease control technology coupled with production contracts revolutionizing the poultry industry in the 1950s and the hog industry in the 1980s and 1990s.¹

Through it all, some farms have prospered while other farms have failed, but the general direction has been toward fewer and larger farms, increased productivity, lower real farm and food prices, greater assets and household income per farm, and greater dependence by farmers on off-farm inputs and jobs. A dual agriculture has emerged, with relatively few large farms accounting for most output and many small farms accounting for most farms.

Vertical coordination (featuring integration of farm product marketing or input supply with production agriculture through integrated ownership, production contracts, or marketing

¹ Major upheavals in farming also have occurred from national economic shocks including the Great Depression of the 1930s and the farm financial crisis of the first half of the 1980s. In addition, farmers are buffeted by the shocks of drought causing crop failures as in 1934, 1936, 1983, and 1988, by floods such as in 1993, and by a fickle international export market that failed in the 1930s, but prospered in the 1970s and late 1990s.

contracts) now accounts for over 40 percent of farm output and is virtually complete in fruits, vegetables, poultry, and dairy (marketing orders). Production contracts are growing rapidly in hogs and today approximately one-third of production is vertically coordinated. Vertical coordination, environmental regulations, and economics have shifted livestock production from the Midwest to the South where labor is cheaper, and to the Great Plains and Mountain states where open spaces and semi-arid climate minimize environmental problems and complaints.

Forces of technology, international competition, the environment, and public policy continue to drive change in agriculture. Twenty-first century commercial agriculture will be technologically advanced, large-scale, capital intensive, environmentally sound, scientifically based, internationally competitive, market driven (but government regulated), and managerially demanding. The challenges and rewards are breathtaking! Some large farms will be major businesses earning high rates of return. Operations of any size that fail to keep pace will not be treated kindly by markets.

The outlook is for continuing change in a nation already fatigued by downsizing, outsourcing, mergers, spin-offs, reengineering, restructuring, and reinventing. Is it any wonder that many farmers are asking for “time out?” Many want to stop or at least slow a world they feel is accelerating out of control in search of ever higher profits and living standards they feel too harried to enjoy.

Why Industrialization?

Industrialization of agriculture is occurring because integrated ownership or production contracts often offer the opportunities for coordinated operation and controlled breeding and feeding useful to produce a standardized steady stream of the right quality of output at the right time at the right place at the right price. Larger operations can feature the scientific input, specialized resources, and low variable costs from production and marketing processes resembling those in nonfarm factories. Industrialization is occurring because larger farms are able to produce products desired by consumers at lower costs than can smaller farms. Of course, economies of size differ among enterprises and there is no one optimal size of farm. Nonetheless, cash grain farms typically require \$200,000 in annual sales and dairy farms require 300 or more cows to produce at lowest cost per unit. Cows on many dairies in California number in the thousands, and a few Midwest dairies are aiming for like numbers. While unit cost curves rarely turn up (to indicate rising cost per unit of output as size increases), some farms can be too large to manage efficiently. A well-managed large farm will out-compete a well managed medium-size farm. But a well-managed medium-size farm can out-compete a poorly managed large farm.

Some large farms access public capital markets and disperse ownership to avoid intergeneration financing and cash-flow problems plaguing traditional family farms. In short, the above features including the ability to spread high fixed costs from “lumpy” inputs over many units of output enable large farms to produce at lower total cost per unit of output than smaller farms.

Industrial farms also have disadvantages. Many Americans find confinement livestock systems objectionable as a matter of principle. Odors, flies, and waste disposal are frequently problematic on large farms. Costs of bringing in forage and moving waste out of a 3,000 cow dairy operation are staggering. Costs are high for large farms to spread waste widely enough to make best use of nutrients and avoid pollution of ground and surface water.

Laborers on some large farms are poorly paid, poorly housed, and poorly treated. They do not display the pride of ownership and operation enjoyed by a successful farm owner-operator. They may be foreign-born workers unappreciated in a community committed to retaining its heritage. On the other hand, it is arrogant to presume that every adult on farms has the management and other skills necessary to be a successful family farm operator.

Sub-therapeutic use of antibiotics is useful for controlling disease in large, confinement livestock operations. Resistance to antibiotics developed by organisms in livestock may attend those organisms passed to humans.

Problems of odor, waste disposal, and family farm preservation noted above sometimes are what economists call *negative externalities* not entering the financial accounting of market participants and, hence, not guided by the market. Efficient production for the good of the nation, however, requires that externalities be internalized, that is, that farms either pay compensation for or control odors, water quality degradation, and soil erosion damaging others. Sometimes the best solution is to locate in a region where these negative externalities either are not a problem

(e.g. odors in the sparsely populated Great Plains) or are not viewed as a problem (in some farming areas manure smells like money, not waste). However, the few experts I have consulted contend that large farms will produce more cheaply than small farms even when all environmental costs are accounted for. And markets have indeed passed lower farm food ingredient cost-saving to consumers.

If costs are lower on large farms even when social costs are included, simply requiring large farms to pay all costs will not stop the industrialization of agriculture. Are stronger measures needed? It is for the political process rather than for economists to answer that question. If asked to choose, economists have no objective means to decide whether lower food costs or more traditional family farms are best for society.

Social and economic vitality of rural communities is usually best served by family farms with middle class operator-families and lots of value-adding livestock to multiply crop returns. The Midwest once was both the nation's feed basket and its livestock basket. However, traditional family farms in the great Midwest feed basket have been shedding livestock at a rapid rate. The Midwest is unlikely to see that livestock production return from the South and West except as large, integrated operations. Thus, Midwest communities face a dilemma: the only thing worse than relying on an economic base of large, integrated livestock farms may be to have no local livestock farms at all.

The political issue whether society is best served by vertical coordination and factory farms first needs to be addressed at the national

level. Deciding the issue state by state will merely drive industrial farming to the states that allow it. Industrial farms excluded from state X will go to state Y where they, along with other large-scale farms, will drive down nationwide prices—including prices in state X. This denies to family farms in state X the benefit of survival afforded by contracting with an integrator to produce broilers or hogs essential to preserve their “family farms.” Problems of defining what is an acceptable and unacceptable farm and then administering and enforcing the concept seems so huge then national legislation is likely to arrive slowly, if at all. Some environmental standards need to be set nationally to avoid any “race for the bottom” as states compete for economic activity by lowering standards. Rules need to be tailored to circumstances, however, because environmental problems differ among soils, climate, topography, and population density.

Assuming industrial farms are deemed acceptable and environmental regulation is formulated at the national level, then each local township or county can be free to decide whether to allow such farms. Densely populated areas would mostly reject such farms. Receptive counties would compete for the employment and income benefits of additional value-added agricultural enterprises in their community. The cost of a positive decision will become less as technology improves to reduce livestock waste odors and lagoon failures.

Questioning the System

The foregoing discussion begs more fundamental questions of whether there is a better way to organize the

economy to avoid structural adjustment trauma. Perhaps the most basic decision of any society is how best to meet the needs of its people. Americans overwhelmingly choose democracy. They also choose markets—two-thirds of the economy relies mostly on markets to determine when, what, how, and where to produce.

The choice of democracy is non-controversial. The choice of the market also is not very controversial following the spectacular failure of socialism in the former East Block and North Korea contrasted with the spectacular success of market economies from East Asia to Chile. The Great Depression removed the case for *laissez faire* (markets only); the fall of socialist economies worldwide removed the case for government only.

So most Americans are committed to democratic-capitalism. “The devil is in the details,” however—in the many difficult choices and compromises between markets and government. Where in specific situations should control rest—with the market or with the public sector? Or as the widely popular Cooperative Extension Service series posed the issue some years back: “Who will control agriculture?” How free should markets be and how high and wide should the public safety net be?

What Economics Says

Choosing a System

The choice of political-economic system is ultimately political, but economics has much to offer. It begins with the proposition that people seek economic efficiency, equity, and freedom. Other goals could be specified such as international competitiveness, growth, and environmental protection,

but these will be served by efficiency: a system allocating resources, including savings and investment, to where *social* (not just private!) returns are highest in a competitive economy will be economically efficient, will grow at an appropriate rate, and will be environmentally sound.

Justice or fairness is part of equity and also is ultimately a political decision. Economists have shown, however, that poor people derive much more satisfaction from another dollar of income than do rich people (Blue and Tweeten). Economists also show that societies such as Sweden emphasizing equity through the social welfare state sacrifice economic growth (Crook, p. 12). Numerous welfare states in western Europe have democratically chosen a high safety net at a cost of high unemployment, slow employment and economic growth, and risk of global economic and technological marginalization. Thus, although economics does not specify the proper size of a safety net to promote equity, a higher safety net tends to go with slower economic growth.

Pursuing Efficiency

Economic theory and practice provide compelling evidence that the market provides unparalleled efficiency for so-called market goods defined as goods that are rival, exclusionary, and transparent. So-called public goods lack these characteristics. A underutilized bridge is a *public good* because it costs nothing for another auto to use it—hence discouraging use by charging a fee unwisely diminishes costless use. A nonexclusionary good must be provided by the public because a private firm producing it will not be able to exclude

free-loaders. The private firm will not cover costs necessary to produce the good. In the case of a nontransparent good, consumers do not know what they are buying and, hence, do not know how much to acquire or how much to pay a private supplier.

For these reasons, the market alone does not supply enough market information, basic research, environmental protection, and product quality identification in agriculture. A public role is appropriate to supply or coordinate these functions. The important point, however, is that agricultural commodities are market goods, not public goods, which markets allocate with maximum efficiency. Markets for sugar, tobacco, peanuts, and dairy products work. Continued government intervention in the markets have no more justification than in grain markets, although adjustment pains to markets may be more severe due to severe existing market distortions. The argument in the case of tobacco is not that the market prices should be lower (perhaps they should be higher to discourage smoking), but that the tax on tobacco customers accrue to the health industry rather than to tobacco quota holders.

The impersonal nature of the market is both its strength and weakness. An efficient market favors or culls producers based on their ability to turn a profit rather than on their lineage or political connections. The agony and ecstasy that results is a form of social Darwinism called *creative destruction* by Joseph Schumpeter. An economy progresses through a relentless dynamic of punishing laggards and rewarding ingenuity. No substitute has been found

for this process creating the highest living standards in the world.

Neoclassical economics reduces to the simple proposition that an action is warranted if benefits exceed costs. Because people tend to be rational in making decisions on that same basis, neoclassical economics is both an ideological framework and a good predictor of behavior. Neoclassical economics is favored by economists not just because it is an elegant model, but because it both explains and predicts well. It works!

The most important development in the field of economics during my career is the triumph of the *standard model* (Tweeten 1997). Any country following that economic policy model emphasizing private enterprise but with a lean and effective public sector doing a few things well can be food secure and economically comfortable if not rich. That standard model emphasizing mostly markets, but also a lean, effective government providing public goods and correcting externalities has been criticized as providing food for profit and not for people. Those who favor providing food for people, not for profit, can learn from China. By shifting from the system of food for people (People's Republic) to food for profit after 1978, perhaps 100 million people have been brought out of poverty and food insecurity.

Populist groups have perennially been highly critical of American agribusiness firms such as Cargill and Monsanto specifically, and of grain, banking, and futures markets generally. After reviewing a substantial number of studies of the conduct and performance of American agribusiness, I find no foundation in fact for charges that farmers are systematically exploited by

the agribusiness sector (Tweeten 1989, Ch. 8). Of course, there are exceptions. But American agribusiness is the most innovative and efficient in the world. Cooperatives help to keep private firms honest. Ironically, a major cause of structural adjustment pain in farming arises because agribusiness performs "too well." The continuing stream of new labor-saving and cost-reducing inputs made available to producers places continuing and often painful pressure on producers to adjust.

Serving Equity

I noted earlier that farm commodities are not public goods, but rather are market goods allocated most efficiently by markets. To be sure, major government programs have supported farm commodity prices since 1933, but at a cost (lost national income) of \$5 billion or more per year in the 1950s, 1960s, and early 1980s (see Tweeten 1989, Ch. 10). Such intervention led humorist P. J. O'Rourke to jest that three bastions of Marxism remain: North Korea, Cuba, and American agriculture. Thus, government interventions to idle cropland, accumulate storage stocks, and support farm prices must be justified on equity rather than efficiency grounds.

Commodity programs are difficult to defend on equity grounds or to save the family farm. The net worth of commercial farm families (crop and livestock sales over \$100,000 per year or more) who receive the lion's share of program benefits averages nearly \$1 million, or several times that of the average taxpayer or consumer paying for programs.

Evaluating the worth of family farms by efficiency alone can miss the point, however. For example,

economists might note that the Liberty Bell is worth \$2 for scrap bronze, yet the public has justifiably spent millions of dollars to preserve and display it because it is considered to be an essential part of our heritage.

In 1985, a random poll of American adults found that 82 percent agreed with the statement that “the family farm must be preserved because it is an essential part of our heritage” (Jordan and Tweeten). Presumably, Americans want to preserve family farms because they are unique. A recent study by Drury and Tweeten indicates that farmers are indeed unique. For example, farmers are more frequent churchgoers, and have much lower crime rates and divorce rates than people in other occupations and places of residence.

Where does this argument for preserving family farms as a vital part of our heritage break down? The answer is that commodity programs have not saved family farms despite \$363 billion spent by taxpayers from 1933 to 1997 on such programs, plus another \$20 billion of losses on loans by the Farmer’s Home Administration (now part of the Farm Service Agency).²

Statistical evidence indicates that federal assistance saved many family farms in the short run during the financial crisis of the early 1980s. But in the long run the capital, security, and acreage diversion provided by programs actually speeded trends towards fewer and larger farms (Tweeten 1993). Because support of commercial farms receiving the vast majority of program benefits is essential for political viability of commodity programs, efforts are probably futile in

Congress to realign programs to serve small farmers. Also, difficult political and administrative issues arise in targeting benefits—issues such as what is a small farm or a family farm.

Poverty is rare indeed among commercial farm operators. Reform of government programs to address problems of low income in farming would need to emphasize not commodity programs, but human resource development for poor families of hired workers and operators of small farms.

The nation will continue to lose noncommercial farms at the rate of 2 percent annually, but commercial farm numbers will not change much. Does the nation need to try to stop change to reduce psychic adjustment costs? Leaving a farm in mid-career can be more traumatic than leaving other employment because the farm is a way of life and home as well as a job. Nonetheless, leavers appear to make favorable adjustments. A 1987 survey in Oklahoma of 295 mid-career farm leavers found that those who felt they were somewhat or much better off outnumbered those who said they were somewhat or much worse off by a ratio of 3 to 1 (Perry *et al.*, p. 55). Two-thirds of the 624 former farmers in North Dakota surveyed in 1986 said they were better off since they quit farming (Bentley *et al.*, p. 11).

An efficient, dynamic economy can also be a caring society. I have contended for decades that greater provision should be made for those left behind by technology and change. The public and private sectors could support more personal and financial counseling, job information and training, and moving assistance to ease adjustments for people who leave farming in mid-career. The

² In 1997 constant dollars, taxpayers spent \$533 billion from 1965 to 1997 alone for farm income stabilization.

national dividend from greater productivity in agriculture dwarfs the value of resources needed to help those left behind.

In 1995 (the last year available) farm operator household income averaged \$44,392 for the average U.S. household (U.S. Department of Agriculture, p. 13). Average household income was similar by type of farm: for cash grain; “other crops;” beef, hog, or sheep; dairy, and “other livestock” farms. These data indicate that the farming industry is near economic equilibrium after lagging behind income of nonfarmers for many decades.

While household income data point to an industry near economic equilibrium, they also point to a disturbing equity issue: household income of operators with less than a high school education averaged less than half (\$30,173 versus \$63,075) that of households with college educated operators (U.S. Department of Agriculture, p. 14). Those numbers point to a broader and more serious national equity problem: the growing disparity between the income of the lower and upper half of the population. The lower half of the divide, mainly those with less than a college education, are disproportionately represented in the nation’s pathologies: single parenting, school dropouts, drugs, crime—and is creating another generation with the same attributes. Recognizing that farmers derive 90 percent of their household income from off-farm sources, the solution to the widening income distribution on farms and in society must be found mostly in off-farm employment.

Of that portion of income inequality that could be explained by William Cline of the Institute of

International Finance, 60 percent was accounted for by technology, 16 percent by trade, and the remaining 24 percent was due to lower minimum wages, less union strength, and more immigration (see Davis, p. A2). A major cause of the widening income distribution is technology—society rewards those best able to create, operate, and manage high technology and pop culture in which this nation excels. The one-sixth of the problem attributed to freer trade arises because markets reward the Bill Gates and Michael Jacksons who excel in the high-tech industries and pop culture exported to the world. Initially at least, trade worsens the situation for unskilled operatives in textile mills and shoe factories competing with third-world labor. Similar reasoning could be applied to commercial versus noncommercial farms.

The answer to this massive problem is not to bind technology (Ludditism) or to restrain trade (autarky) any more than the answer to getting too small a piece of pie is to bake a smaller pie. The answer is to increase the economic pie through efficiency gains, but invest more in better schools (school choice, longer school terms, etc.), vocational-technical training, and other measures to improve human resources. The answer also is to use the great efficiency gains from improved technology and free trade to supplement wages of low income workers. I have proposed a wage supplement paying (say) 60 percent of the shortfall of a worker’s actual wage below a target wage. If the target wage is \$12 per hour and a worker is worth only \$2 per hour to an employer, the wage supplement would be \$6 $[0.6(12-2)]$ per hour. Hence, total earnings would be \$8 per

hour which at 2,000 hours per year would reach the poverty threshold of \$16,000 for a family of four. That plan would encourage those with marginal skills to work, encourage employers to hire them, and could be consistent with greater employment and the work ethic necessary to reduce the pathology of despair noted earlier among the underclass. The Earned Income Tax Credit could be retained for those such as farm operators who are self-employed.

Other Goals

Well-being of people is more than about economic efficiency and equity discussed in the foregoing paragraphs. Well-being also is about freedom and democracy, but only market economies have enjoyed freedom and democracy. No socialist economy has also been a democracy. Critics might note that one sector such as the dairy industry can be centrally planned with incomes guaranteed by subsidies from consumers or taxpayers in a rich market economy such as ours. However, such an exception for dairy is not a good example for how to run an economy.

To be sure, a public role is essential to protect the environment and to provide for infrastructure and services such as education, research, information systems, and food safety. But provision of these public goods requires resources including competent civil servants—resources affordable thus far only in capitalist societies. Socialist economies not only have trouble feeding themselves, they also have failed to protect their environment. Economic growth that attends market economies under the standard model causes nations to move through the demographic transition from

high to eventually low birth, death, and population growth rates essential for the planet to live within its environmental and natural resource carrying capacity.

Little has been said of stability in agriculture. The market provides for stability through private storage stocks, forward markets (futures, options), insurance, and other means. Farmers are no longer welfare cases—they can afford to pay for risk management tools. The fact that private buffer stock holders have higher discount rates and, hence, higher costs of storing commodities than does the public, may lead some to conclude that this externality justifies public stabilization of food supplies and prices.

More than this externality must be shown to justify government involvement in stabilizing food supplies and prices. The second requirement is a positive answer to the question: Is the cost of government market intervention (bungling, waste, mismanagement) less than the social loss from the market failure? Judging by past government buffer stock management, the answer to that question is “no” (see Gunasekera and Fisher; McClatchy *et al.*). It also is difficult to justify government provision of crop insurance because subsidies encourage undesirable variation in production, and the farming of high-risk, environmentally sensitive land.

Summary and Conclusions

Dairy farmers are feeling the impact of a new wave of industrialization in agriculture. Adjustments are often painful and the public sector could do more to ease the transition of displaced persons to alternative employment.

Examples are personal and financial counseling, job information and training, and moving assistance. However, data indicate that most of those who leave farming in mid-career make successful adjustments to alternative employment and residence.

At issue is whether to stop the industrialization of agriculture. It would certainly be difficult, if not impossible, to halt factory farming and vertical coordination. But, the decision to stop or slow industrialization is for the political process and is not for economists. Economists can point out the cost in lost family farms of continuing industrialization. But they also can point out that industrialization brings lower food cost—likely even if firms are regulated to internalize their externalities as seems appropriate. The decision by one state to reject industrialization will only shift industrialization to other states and deprive local farmers and communities of an emerging economic base. Many integrated poultry growers and hog producers, for example, view integration as essential to preserve their family farms and way of life. Local areas could have greater say in whether they wish to allow factory farms, however.

This paper raises the broader issue of whether America is operating under the proper democratic-capitalistic system if that system has not retained a longer number of family farms and has permitted the industrialization of agriculture. While “the system” has numerous flaws, it also has great strengths. The conclusion (paraphrasing Winston Churchill) is that democratic-capitalism is the worst system—except for all the rest. I enumerated several proposals to improve the system, but great care must be taken to avoid well-

intentioned reforms that when applied are counter productive.

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