Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://foodsystemsjournal.org

THE ECONOMIC PAMPHLETEER
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Economies of scale in food production

Published online February 12, 2023

Citation: Ikerd, J. (2023). The Economic Pamphleteer: Economies of scale in food production. *Journal of Agriculture, Food Systems, and Community Development*, *12*(2), 155–158. https://doi.org/10.5304/jafscd.2023.122.002

Why do industrial agricultural operations continue to displace smaller family farms in spite of their continued pollution of the natural environment and degradation of rural communities? Large-scale, specialized agricultural operations, such as concentrated animal feeding operations (or CAFOs), persist because they have an economic advantage over smaller, diversified farming operations. They have higher ecological and social costs but lower economic costs. This economic advantage is commonly referred to as *economies of scale*.

In economic theory, there are two types of economies of scale. *Internal* economies of scale refer to differences in the costs of production associated with different sizes of production units. In animal agriculture, "scale" refers to the number of hogs, poultry, milk cows, or beef cattle in a single farming operation or *production unit*. In field crop and pasture-based animal production, scale refers to the acres of land in a single production

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*Why an **Economic Pamphleteer?** In his historic pamphlet* Common Sense, *written in 1775–1776, Thomas Paine wrote of the necessity of people to form governments to moderate their individual self-interest. In our government today, the pursuit of economic self-interest reigns supreme. Rural America has been recolonized, economically, by corporate industrial agriculture. I hope my "pamphlets" will help awaken Americans to a new revolution—to create a sustainable agri-food economy, revitalize rural communities, and reclaim our democracy. The collected Economic Pamphleteer columns (2010–2017) are at https://bit.ly/ikerd-collection*

unit. *External* economies of scale, on the other hand, refer to differences such as the costs of fertilizer or feed, or the cost of complying with government regulations, for different sizes of *management units*. Management units may include one or more production units under single management or control (Ross, 2022). A single farm or production unit may comprise multiple parcels of land, but a farm management unit may comprise multiple farms that are managed as a single economic entity or unit.

While the fixed costs associated with buildings, equipment, land, and other capital investments are generally higher for a larger farming operation, it can often make use of more efficient production technologies—such as a larger tractor, its own combine harvester, or a livestock confinement building. However, *internal* economies of scale of industrial farming operations exist primarily because specialized, standardized, mechanized operations are easier to manage than are diversified, individualized operations that depend more on skilled labor. Regardless, even for industrial operations, there are limits to internal economies of scale.

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As an industrial farming operation becomes larger, it can become complex and difficult to manage. At some point, the rising costs associated with decreasing management efficiency exceed the reduction in total costs associated with spreading fixed costs over additional production or output. This point is referred to as the "maximum economies of scale" for a single farming operation. Additional economies of scale may be realized by larger operations that own or control several individual farming operations of production units. This is the reason multiple hog confinements, feedlots, poultry buildings, and cropping systems are often managed or controlled by single entities called "integrators."

External economies of scale exist for both single farming operations and for operations that control multiple farms or livestock production units. The cost advantages include an ability to purchase feed, feeder animals, fuel, fertilizer, and other production inputs at a lower cost by buying in bulk or in truckload units. Additional price advantages include the ability to bargain for higher prices or to deliver crops or livestock to market in semitrailer truck load lots. Larger operations may also have the ability to hire better unit managers. Any *external* economic efficiency of larger individual farming operations may be multiplied by controlling or managing multiple farms or livestock production units.

Interestingly, the economic advantages of large industrial agriculture operations and integrators are primarily *external* rather than *internal* economies of scale. A variety of studies have shown that most *internal* economies of scale can be achieved by well-managed, diversified, individually owned and operated family farms (Duffy, 2009). External economies of scale for large, industrial agricultural operations arise from the ability to manage, control, and reap the economic benefits from large quantities of agricultural production, rather than from the internal economic advantages per bushel, hundredweight, or other unit of production that benefit single farming operations.

The following is an example of how economies of scale might play out on different types of farming operations. A 100-sow farrow-to-finish hog operation on a diversified family farm might market 2,000 finished hogs per year. The farmer would need to net $20 per hog to earn an income of $40,000 per year from the feed-out phase of the hog operation. A single CAFO operator might be able to produce 5,000 hogs a year, since CAFOs are specialized, routinized, mechanized and thus easier to manage. The CAFO operator would need to net only $8 per head, rather than $20, to earn $40,000 income from 5,000 hogs. So, the CAFO operator can net $12 less per hog to realize the same income as the diversified farmer.

Individual CAFO operators typically have

operated under comprehensive contracts with processors. Increasingly, however, corporate integrators are managing multiple CAFO production units that contract collectively with processors. For example, an integrator might contract with the operators of five CAFOs producing 5,000 hogs each, or 25,000 hogs in total. The integrator could pay each unit operator $10 per hog, rather than $8, and still have a $10 per-hog advantage over the diversified family farmer. The integrator would net $10 per hog on 25,000 hogs, individual CAFO operators would then net $10 per head on 5,000 hogs, compared with the diversified farmer who would net $20 per head on 2,000 hogs. In terms of *total income*, the integrator would net $250,000 ($10 x 25,000) compared with $50,000 ($10 x 5,000) for the CAFO operator and $40,000 ($20 x 2,000) for the diversified farmer.

The integrator could accept a significantly lower profit per hog and still have an economic advantage over smaller, diversified hog farmers in terms of income. Even if the smaller hog producer had lower per-hog production costs and could earn $60,000 on 2,000 hogs, the integrator could pay CAFO operators $15 per hog rather than $10 and both CAFO operator and integrator would still have an economic advantage over the diversified farmer. The diversified farmer's ability to compete in terms of *internal* economies of scale is overwhelmed by the *external* economies of large-scale, industrial hog production.

This type of economic advantage might be defined more accurately as the *economies of span* rather than *economies of scale*. Operators of multiple production units (like multiple CAFOs) are often able to negotiate with suppliers to reduce production costs and with buyers to increase prices. However, the primary economic advantage comes from the span of management control rather than either internal or external economies of scale of individual production units. Integrators who have the ability to acquire and manage large amounts of money do not need an economic advantage in either cost per unit produced or price per unit sold. As long as production is profitable, they are able to make more profit simply by acquiring or controlling more land, buildings, equipment, and using more costly production technologies. This is the primary economic advantage of large-scale industrial agricultural operations today. The same basic kind of advantage exists for large food processors and distributors.

Why should consumers be concerned about economies of scale in agriculture? Consumers are led to believe they are the beneficiaries of the cost savings of corporate agriculture. With economically competitive markets, the benefits of lower costs of production would be passed on to consumers. However, in today's corporately dominated markets, there is no economic incentive for large-scale agri-food producers to share their economic advantages with consumers. In fact, their market domination means they can negotiate for higher prices for their products. They need only keep their margins of profit low enough to maintain comfortable positions in their overall markets.

Large corporate retailers and processors manage their business in order to maximize economic returns to their investors, rather than minimize costs to consumers.

These large corporate retailers and processors manage their business in order to maximize economic returns to their investors, rather than minimize costs to consumers. They are also able to dictate prices and terms of production to even the largest of industrial agricultural producers. For example, they pay CAFO operators just enough to keep them producing until they find others operators, often with newer facilities, who are willing to produce for even less. Lower procurement costs are added to corporate profits—not subtracted from retail costs for consumers.

If economically competitive markets were restored for agricultural commodities, retail food prices might actually decline. There also would be an economic incentive to shift from producers with *higher per-unit* costs to producers with *lower per-unit* costs of production—from large, corpo-

rately controlled, industrial farming operations to well-managed smaller, independent family farms. Several pieces of federal legislation have been proposed to restore competitiveness to agricultural markets, but they will need strong public support to be enacted into law. The first step in restoring competitive markets is for consumers to understand that the environmental and social costs far outweigh any economic benefits they receive from economies of scale, or span, in industrial agriculture.

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