

FARMING IN THE 21ST CENTURY

by

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Staff Paper # 99-9

August 31, 1999

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Purdue University

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Preface

The U.S. agricultural industry is in the midst of major structural change — changes in product characteristics, in worldwide production and consumption, in technology, in size of operation, in geographic location. And the pace of change seems to be increasing. Production is changing from an industry dominated by family-based, small-scale, relatively independent firms to one of larger firms that are more tightly aligned across the production and distribution chain. And the input supply and product processing sectors are becoming more consolidated, more concentrated, more integrated.

Agriculture in the 21st century is likely to be characterized by: 1) adoption of manufacturing processes in production as well as processing, 2) a systems or food supply chain approach to production and distribution, 3) negotiated coordination replacing market coordination of the system, 4) a more important role for information, knowledge and other soft assets (in contrast to hard assets of machinery, equipment, facilities) in reducing cost and increasing responsiveness, and 5) increasing consolidation at all levels raising issues of market power and control.

These profound changes in the agricultural industry present new challenges and new opportunities that require new ideas and concepts to analyze and implement. They require new learning and thinking. Some of those new ideas and concepts are presented here, not as empirically verified truths, but as “thoughts” to stimulate different and better thinking. They have been developed based on observations, analysis and discussions with numerous managers and colleagues in agribusinesses in North America and Europe. This series focuses on Farming in the 21st Century; companion series are also available on Financing and Supplying Inputs to the 21st Century Producer (Staff Paper 99-11), and Value Chains in the Food Production and Distribution Industries (Staff Paper 99-10).

Our purpose in sharing these “thoughts” is to invite discussion, dialogue, disagreement — in general to encourage others to develop better “thoughts”.

Keywords: qualified supplier, biological manufacturing, strategic risk, process control, economies of size, franchise grower

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Economies of Size and the Future of Small Farms

A critical issue in the discussion and debate concerning industrialization of agriculture concerns the economies of size in agricultural production and the shape of the long run average cost curve. The conventional economic model infers a U-shaped long-run cost curve that initially declines as size or scale increases, reaches a minimum, and then rises with further increases in size or scale. The fundamental issue is — does this shape of the cost curve characterize agricultural production?

Empirical studies and farm records appear to verify that the cost curve for agricultural production does decline with increasing size or scale of operation. There is debate about how quickly that cost curve declines — i.e. what size is needed to capture most of the economies of size. Farm record data implies that very small farm businesses have relatively high total costs (although they may also have very low variable cash cost), and that costs decline rapidly with modest increases in size with only slight or little decline in cost as farms increase in size from average or even smaller than average size operations. But that is not the whole story, and maybe not the most interesting part of the story.

The more interesting questions are the following. First, do costs eventually go up with further increases in size? Does the cost curve for agriculture exhibit a steep sided, flat bottom U-shape, or is it instead L-shaped where costs are relatively constant after a particular point as size increases? Second, in a dynamic context, even if costs do rise with increasing size at a particular point in time, over time do new technology and improved management practices combined with innovative entrepreneurship of the long-run average cost curve. In essence, the question is can smart farmers as they gain experience over time lower their cost such that what might be a steep sided flat bottom U-shape cost curve at a point in time is in reality a L-shaped cost curve over time.

The third question is one of the unit of measurement. Are we measuring the cost curve for the plant, or the cost curve for the firm? Most studies of economies of size in agricultural production using farm record or other data measure the cost curve of the plant (the farm) and conclude that this cost curve also is the cost curve for the firm. But increasingly in agriculture, we are recognizing that the plant and the firm are not the same entity. Just like in the industrial sector, a firm may have many plants with each plant being of optimal size to have the minimum cost. If the plant cost curve did have the classic U-shape form, one strategy farmers might use is to determine the optimal, minimum cost plant size and expand the size of the firm by replicating this size plant. So one strategy to keep cost from rising as a firm expands is to use a replicate strategy where the firm is comprised of multiple minimum cost plants. This in fact appears to be the strategy being used by larger scale integrated hog producers who have chosen plant sizes of 2400 or 3600 sows, and then when they desire to increase the size of their firm do not add additional capacity to the current plant, but instead put in place new plants of 2400 or 3600 sow size.

So the really important questions concerning the trend to larger farm sizes are not whether costs decline as size increases. They are instead whether they rise after a particular size is attained. In fact, even if cost were invariant by size — in other words we had a constant cost industry with a flat cost curve — farm size would likely increase over time if the industry is profitable. Even for constant cost industries, managers who generate profits typically reinvest those profits back in the firm and grow the business. And if there are other barriers to entry such as access to capital or acceptable land rental arrangements as frequently characterizes small farm businesses, it is difficult for smaller operations to enter or be viable even if they have identical costs to those of larger units.

So the real issues in the discussion and debate of the viability of small farms, the trend to larger scale units and the future size structure of agriculture from the perspective of efficiency and cost is not whether small farms are as efficient as moderate size farms. It is first whether in a longer term context larger, multi-plant agricultural production firms have higher cost than moderate and small size single plant agricultural production firms? A second critical question is over time, if a firm is profitable, will the managers of those firms reinvest their earnings back in the business, or will they invest it elsewhere? If one concludes that for the reasons noted above the cost curve for agricultural production probably exhibits a L-shape rather than a steep sided U-shape (i.e. that cost most likely do not rise with increases in firm size), and that managers will likely reinvest earnings back in their core businesses, farm size is likely to continue to increase. Thus, rising costs are not likely to constrain growth in farm size, and the rate at which farms will grow in size over time will be primarily determined by the profitability of the business and the amount of net earnings that are retained and combined with debt capital to expand the business.