SARE Project LNC93-55

Profitability Comparisons: Are Emerging Results Conflicting or Are They Beginning to Form Patterns?

Presentation by

Thomas L. Dobbs
Professor of Agricultural Economics
South Dakota State University

at

Symposium on "Sustainable Agriculture: Conceptual and Methodological Issues"

August 8, 1994
American Agricultural Economics Association Annual Meeting
San Diego, California

Studies comparing the profitability of "conventional" and more "sustainable" farming systems have produced results that may appear conflicting. Cacek and Langner's 1986 literature review revealed mixed results regarding profitability. Profits were greater for conventional systems in some instances, and greater for organic systems in others, depending on the geographic area and farming enterprises. (Organic farming is generally considered to be one form of sustainable farming.)

Madden and Dobbs (1990) reviewed literature through the late 1980s and concluded that emphasizing legumes in rotation and minimizing or eliminating synthetic chemical inputs both offer encouraging farm-level profitability prospects. However, a concurrent literature review by Crosson and Ostrov (1990) reached more negative conclusions. Except for comparisons of organic and conventional Corn Belt farms in the 1970s by Lockeretz and associates (e.g., Lockeretz, et al., 1981), the studies they reviewed showed sustainable farms to be less profitable than conventional farms.

Fox, et al. (1991), somewhat more recently, reviewed North American literature that compared the profitability of organic, other sustainable (what they call "alternative"), and conventional farming systems. They found that neither organic nor conventional farming has consistently outperformed the other in profitability. Results also were mixed in studies that compared conventional systems with alternative (sustainable but not organic) systems. Overall, the profitability findings depended not only on variations in production systems and crops produced, but also in weather, soil type, and assumptions about price and cost structure.

My own list of reasons that may underlie *apparent* conflicts in the findings from different studies is as follows:

1. Are **short-run** or **long-run** measures of profitability used?

2. Are the sustainable systems studied still in **transition**, or are they **well established**?

3. Are Federal farm program provisions accounted for in the whole-farm models **or** are they ignored (or greatly simplified)?

4. Is **family labor** included as a cost in the enterprise budgets?

5. Are **externality costs** included (as in Faeth, et al., 1991)? (Normally, they would not be if the focus is on farm-level profitability.)

6. Is the focus on **"practice"** changes or on **whole-farm "system"** changes?

7. Are conventional systems being compared to **organic** systems or to **"low-chemical input"** systems? If the comparison is to organic systems, are organic premiums accounted for?

8. What is the **agro-climatic area** under consideration?

Any or all of these issues can be important as we attempt to make overall sense out of profitability comparisons that are starting to emerge in somewhat greater number now, with completion of initial phases of various sustainable agriculture research efforts. My remarks will focus on the last three, however. I believe that a more clear understanding of these particular issues allows us to see some consistencies and emerging patterns in the profitability comparisons.

Practices vs. Systems

Most profitability studies specify some "alternatives" to "conventional" farming that are thought to be more sustainable ecologically than the conventional methods, and then proceed to estimate the comparative profitability of conventional and alternative--or sustainable--farming. However, the alternative farming methods vary from changes in a single or few practices to changes in whole systems. **Practice** changes, for example, include integrated pest management, changes in fertilization rates and application methods, and changes in tillage methods. By themselves, practice changes leave the conventional crop rotation or crop-livestock system in place, however. Practice changes may mitigate particular environmental problems, but are less likely than system changes to effectively address complex ecological

problems. **System** changes affect the overall ecology of a farm, generally, by changing crop rotations and/or the relationships between crops and livestock; changes in particular practices invariably accompany the system changes. In Midwestern U.S. agriculture, system changes may involve adding forage or green manure legumes and small grains to corn and soybeans in rotations and making livestock rations more forage-based.

The distinction between practice and system changes is critical in interpreting studies such as that recently completed by John Ikerd and colleagues. They evaluated the implications for short-run profits of shifts to "alternative" farming methods that reduce soil loss and water quality risks in nine land resource regions across the U.S. One conclusion of this study was that alternative systems could increase short-run profits, relative to current ("conventional") systems, because cash production costs would decline while total production and returns would stay essentially unchanged (Ikerd, et al., 1993, p. 38). My interpretation of the completion report for this study is that while most or all of the "alternative" farming methods studied entail reduced use of purchased chemical inputs and some involve **system** changes (i.e., changes in crop rotations), perhaps many of the alternative methods involve only **practice** changes (Ikerd, et al., 1992, pp.20-23). If so--and this would by no means decrease the importance of the study or its findings--I am less surprised by the study's conclusion about the overall *current* profitability prospects for alternative methods than I would be if those alternative methods involve mainly **system** changes. I would expect many full-scale system changes to result in some decrease in profits, at the present time, in high-output regions such as the Corn Belt.

Organic vs. Low-chemical Input Systems

Another issue is whether the sustainable systems under consideration are low-chemical input or completely organic--and if organic, whether or not organic premiums are included in the profitability calculations. Organic crop systems, involving no use of conventional chemical fertilizers and pesticides, are generally considered to be at one end of the sustainable agriculture spectrum. Other systems that are genuinely low in their use of chemical inputs and that use diverse rotations and a variety of practices to provide fertility and pest control also usually are placed in the sustainable category. Because of the *zero tolerance* chemical input definition for organic systems, we would expect it to be the most difficult for those particular sustainable systems to be competitive with conventional systems, **unless** pertinent organic premiums are factored in.

Findings from two recent studies in which the sustainable systems were organic and in which applicable organic premiums were accounted for are shown in Table 1. Figures for the Ohio

comparisons are derived from data for "representative" (synthetic) farms reported by Batte, et al. (1993). Those figures show the organic system to be substantially more profitable than the conventional system when organic premiums are accounted for, but less profitable when they are left out of the calculations. Of course, we must remember that an organic farmer may employ a different crop mix than that specified if he or she is not expecting price premiums from particular crop products.

Profitability comparisons for South Dakota also shown in Table 1 are from a study by Dobbs, et al. (1991a). Three different agro-climatic areas are shown; the northeast and northwest areas are ones in which spring wheat is an important crop, and the southwest is one in which winter wheat is important. In two of these three areas, organic premiums tip the scales in favor of the organic systems. The organic system is more profitable (actually, less unprofitable) than the conventional system in the northwest area even without the premiums.

One needs to be careful in comparing the Ohio and South Dakota studies because different profitability measures were used and because capital- and labor-intensity is much different in the Corn Belt portion of Ohio than in South Dakota's portion of wheat country. Nevertheless, it does appear that price premiums may be relatively more important, at the present time, to the competitiveness of organic systems in the Corn Belt than in wheat areas of the Northern Plains. This leads directly into my next issue, concerning differences among agro-climatic areas.

Agro-climatic Area Differences

A pattern seems to be emerging from recent studies: sustainable systems at present appear more competitive with conventional systems in predominantly small-grain areas, or in transition areas between the Corn Belt and small-grain areas, than in the Corn Belt. As examples, recent results from three States are shown in Table 2.

The first set of comparisons shown is for northeast Iowa, part of the Corn Belt. Here, one type of conventional system, continuous corn, earned slightly less than the alternative (low-chemical input) system. The other, however, a corn-soybean rotation, earned substantially more. In reality, the chemical input-based corn-soybean rotation is the conventional system with which alternative or sustainable systems must compete in the Corn Belt.

Three sets of comparisons from recently completed South Dakota studies are shown next. All three are based on observations over a 7-year (1986-1992) time period. The first compares a conventional and an organic (actually, organic on most of the cropped acres) farm in east-central South Dakota, an area on the

western edge of the Corn Belt. The conventional farm had a corn-soybean rotation and the organic farm had a small grain-alfalfa-soybean-corn rotation. On average, the conventional farm was much more profitable than the organic farm. Results shown here ignore organic premiums, but an earlier analysis of these two farms showed that organic premiums normally are not nearly enough to make up the difference (Dobbs, et al., 1991b).

The next two South Dakota comparisons come from whole (synthetic)-farm analyses based on long-term trials at a research station in northeast South Dakota. This station is in the transition zone between the western edge of the Corn Belt and the eastern edge of the Northern Plains wheat region. Study 1 at this location compared a conventional corn-soybean-spring wheat system with an organic oats-alfalfa-soybean-corn system. The organic system was substantially more profitable, on average, even ignoring potential organic premiums. In study 2, a conventional soybean-spring wheat-barley system was compared with an organic oats-clover(as green manure)-soybean-spring wheat system. These two systems were of roughly equal profitability, on average. [More details on the results of these two northeast South Dakota studies can be found in Dobbs (1994) and Smolik, et al. (forthcoming).]

The final comparisons in Table 2 are from a recent study of systems in northeast Kansas, another transition zone--in this case, between the Corn Belt and the Central Plains wheat-sorghum region. The conventional system actually consisted of five individual rotations made up of various combinations of corn, soybeans, sorghum, and wheat. The alternative systems each consisted of particular rotations which included forage or green manure legumes [details can be found in Diebel, et al. (1993)]. With 1986-1990 yield and crop price data and 1992 Federal farm program provisions, two of the alternative systems were more profitable than the conventional system and two were less profitable.

Conclusions

I conclude that emerging results from sustainable agriculture profitability comparisons are not simply conflicting and confusing, but, rather, are beginning to form patterns. To discern these patterns, several differences in how and where studies are conducted and in how the results are presented must be accounted for. When that is done--and when a distinction is made between *practice* and *system* changes--it is my contention that some *agro-climatic area* patterns are beginning to emerge.

References

Batte, M. T., D. L. Forster, and F. J. Hitzhusen. "Organic Agriculture in Ohio: An Economic Perspective." **J. of Prod. Agr.** 6, No. 4(1993): 536-42.

Cacek, T., and L. L. Langner. "The Economic Implications of Organic Farming." **Am. J. of Alternative Agr.** 1, No.1(1986): 25-29.

Chase, C., and M. Duffy. "An Economic Comparison of Conventional and Reduced-chemical Farming Systems in Iowa." **Am. J. of Alternative Agr.** 6, No. 4(1991): 168-73.

Crosson, P., and J. E. Ostrov. "Sorting Out the Environmental Benefits of Alternative Agriculture." **J. of Soil and Water Cons.** 45, No.1(1990): 34-41.

Diebel, P. L., R. V. Llewelyn, and J. R. Williams. "A Yield Sensitivity Analysis of Conventional and Alternative Whole-farm Budgets for a Typical Northeast Kansas Farm." Presented at Western Agricultural Economics Association Annual Meeting, Edmonton, Canada, 1993.

Dobbs, T. L. "Organic, Conventional, and Reduced Till Farming Systems: Profitability in the Northern Great Plains." **Choices** 9, No. 2(1994): 31-32.

Dobbs, T. L., D. L. Becker, and D. C. Taylor. "Sustainable Agriculture Policy Analyses: South Dakota On-farm Case Studies." **J. for Farming Systems Res.-Ext.** 2, No. 2(1991a): 109-24.

Dobbs, T. L., and L. D. Henning. "Long-term Economic Performance of Alternative, Conventional, and Reduced Tillage Farming Systems in East-central and Northeast South Dakota." **Economics Commentator No. 330.** Brookings: Economics Dept., South Dakota State Univ., Nov. 24, 1993.

Dobbs, T. L., J. D. Smolik, and C. Mends. "On-farm Research Comparing Conventional and Low-input Sustainable Agricultural Systems in the Northern Great Plains." Ch. 15 in **Sustainable Agriculture Research and Education in the Field: A Proceedings**, B. J. Rice (ed.), Board on Agriculture, National Research Council. Washington, D.C.: National Academy Press, 1991b, pp. 250-65.

Faeth, P., R. Repetto, K. Kroll, Q. Dai, and G. Helmers. **Paying the Farm Bill: U.S. Agricultural Policy and the Transition to Sustainable Agriculture.** Washington, D.C.: World Resources Institute, 1991.

Fox, G., A. Weersink, G. Sarwar, S. Duff, and B. Deen. "Comparative Economics of Alternative Agricultural Production Systems: A Review." **Northeastern J. of Agr. and Resource Econ.** 20, No. 1(1991): 124-42.

Ikerd, J., S. Monson, and D. Van Dyne. "Alternative Farming Systems for U.S. Agriculture: New Estimates of Profit and Environmental Effects." **Choices** 8, No. 3(1993): 37-38.

Ikerd, J. E., S. J. Monson, and D. L. Van Dyne. "Financial Incentives Needed to Encourage Adoption of Sustainable Agriculture." Completion report for an agreement with the U.S. Environmental Protection Agency. Columbia: Dept. of Agr. Economics, Univ. of Missouri, April 1992.

Lockeretz, W., G. Shearer, and D. H. Kohl. "Organic Farming in the Corn Belt. **Science** 211, No. 6(1981): 540-46.

Madden, J. P., and T. L. Dobbs. "The Role of Economics in Achieving Low-input Farming Systems." Ch. 26 in **Sustainable Agricultural Systems**, C. A. Edwards, et al. (eds). Ankeny, Iowa: Soil and Water Conservation Society, 1990, pp. 459-77.

Smolik, J. D., T. L. Dobbs, and D. H. Rickerl. "The Relative Sustainability of Alternative, Conventional, and Reduced-till Farming Systems." **Am. J. of Alternative Agr.** (forthcoming; accepted for publication and revisions in process).

Acknowledgements: Research supporting this paper was funded by the SDSU Agricultural Experiment Station and by USDA "SARE" (formerly "LISA") grants 92-COOP-1-7266 and LWF 62-016-03120. I thank Don Taylor and Lon Henning for reading and commenting on a draft of this paper.

Table 1. Effects of Organic Price Premiums on Relative Profitability of Farming Systems

Study and System	Net Returns in $/Acre
Ohio study[1]	
Conventional system	73
Organic system, without organic premiums	49
Organic system, with organic premiums	134
South Dakota study[2]	
Northeast conventional system	15
Northeast organic system, without organic premiums	11
Northeast organic system, with organic premiums	19
Northwest conventional system	- 6
Northwest organic system, without organic premiums	- 2
Northwest organic system, with organic premiums	1
Southwest conventional system	25
Southwest organic system, without organic premiums	23
Southwest organic system, with organic premiums	29

[1]Source is Batte, et al. (1993). Net returns are to land, fixed investment, and management.

[2]Source is Dobbs, et al. (1991a). Net returns are to management.

Table 2. Effects of Agro-climatic Area on Relative Profitability of Farming Systems

Study and System	Net Returns in $/Acre[1]
Iowa study[2]	
Conventional system 1 (continuous corn)	61
Conventional system 2 (corn-soybeans)	104
Alternative system (corn-oats-alfalfa)	63
South Dakota studies[3]	
East-central conventional system	71
East-central organic system	41
Northeast study 1 conventional system	23
Northeast study 1 organic system	37
Northeast study 2 conventional system	13
Northeast study 2 organic system	12
Kansas study[4]	
Conventional system	28
Alternative system 1	46
Alternative system 2	- 8
Alternative system 3	17
Alternative system 4	35

[1]Organic premiums are not included in any of these net return results.

[2]Source is Chase and Duffy (1991). Net returns are to land and management, with labor assigned a $4/hour charge; government payments are not included.

[3]Source is Dobbs and Henning (1993) and other unpublished data of these two researchers. Net returns are to management, and include government payments.

[4]Source is Diebel, et al. (1993). Net returns are to management, and include government payments.