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Economics of Alternative Farming Systems

by

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The high prices associated with the boom in U.S. agricultural exports during the 1970s stimulated conversion of forage lands to crop production and the use of more intensive farming practices, such as increased use of chemical fertilizers and pesticides. This extension and intensification of U.S. crop production heightened concerns in some quarters about adverse environmental consequences. Increased soil erosion and moisture runoff and both runoff and percolation of fertilizers, herbicides, and insecticides were foreseen by some. In fact, the offsite sedimentation problems and contamination of surface and groundwater supplies resulting from some "conventional" farming practices have become increasingly evident over the past decade.

These "external" costs have generated public pressure to find alternatives to conventional farming systems. Moreover, the rising energy prices during the 1970s and early 1980s have led farmers to seek alternatives to the energy-intensive farming practices which evolved since World War II. The weak farm prices of the 1980s have greatly heightened interest in cost-reducing technologies. Producers are anxious to find farming practices which will reduce energy and other costs without reducing profit levels.

One response to these economic forces has been to explore the use of "alternative" farming systems labeled by such terms as "organic", "low-input", "reduced input", "sustainable", and "regenerative". In general, these terms describe farming systems in which use of petrochemical-based inputs is either eliminated or greatly reduced. To maintain soil productivity and tilth, supply plant nutrients, and control insects and weeds, greater reliance is placed on crop rotations, crop residues, animal wastes, legumes, mechanical cultivation, and aspects of biological pest control. We will simply use the term alternative farming systems here to encompass systems fitting under this general description.

Individual farmers and a few researchers, such as those associated with the Rodale Research Center in Pennsylvania, have experimented for several years with alternative farming systems. A number of farmers in South Dakota, in fact, have been involved in their own on-farm experimentation with such systems. Research recently begun at South Dakota State University (SDSU) also is providing insight on the economic potential for alternative farming systems. Preliminary results of this research are described in this Newsletter issue.

Systems under Investigation at SDSU

SDSU's Plant Science and Economics Departments currently are involved in investigations centered on a set of crop trials begun at the Northeast Research Station near Watertown, S.D. during the 1985 crop year. (The Plant Science work is under the overall direction of Dr. James Smolik.) The SDSU farming system studies at the Northeast Station are grouped into two sets of comparisons.

In Farming Systems Study I, a system characterized as the Alternative rotation,

which involves no chemical fertilizers or herbicides, is compared with Conventional and Ridge Till rotations. Soybeans, corn, oats (as a nurse crop for alfalfa), and alfalfa are included (in that order) in the 4-year Alternative rotation. Corn, soybeans, and spring wheat (in that order) are included in both the Conventional and the Ridge Till rotations.

In Farming Systems Study II, four systems are compared. The Alternative rotation contains soybeans, spring wheat, oats (as a nurse crop for sweet clover), and sweet clover. The sweet clover is included strictly as a green manure crop; it is mowed and chiseled, but not harvested. As in Study I, no chemical fertilizers or herbicides are used in the Alternative rotation. Conventional and Minimum Till rotations in Farming Systems Study II include soybeans followed in turn by spring wheat and barley. The final comparison in Farming Systems Study II involves continuous No Till winter wheat.

Only three years of production data will be available as of Fall 1987. Due to transition effects and climatic variations, it is too soon to draw any firm conclusions from this set of crop trials. Production practices and yields will be monitored for several years in this study.

Nevertheless, initial enterprise budgets have been estimated for the farming systems under examination. These budgets are based on a combination of experience to date, reviews of literature and historical data, and scientific judgment about what the "normalized" practices and yields for these systems will be over time. Detailed budgets and associated assumptions are contained in SDSU Economics Research Report 87-5, prepared by and available from the authors of this Newsletter. Detailed sensitivity and "whole farm" analyses are presently being conducted. The results of these analyses will be reported in a thesis and later publications.

Overview of Initial Results

An overview of the initial results of the alternative farming systems study is shown in Tables 1 and 2. (Results for continuous No Till winter wheat are not shown here because of major questions

about the longer term viability of that system). Yield assumptions are shown in Table 1. The following per-acre costs and returns are shown in Table 2: (1) direct costs other than labor; (2) gross income; (3) income over all costs except land, labor, and management; (4) income over all costs except land and management; and (5) income over all costs except management. Costs and returns were based upon estimated 1987 input and product prices and participation in the 1987 Federal farm program for food and feed grains.

The results show the Alternative systems to have significantly lower "direct costs other than labor" than the other systems. All systems cover full costs (including land) when 1987 farm program provisions are in effect. The various net income figures for the Alternative system are \$5 to \$15/acre lower than those for the other systems in Farming Systems Study I, and nearly the same as those for the other systems in Study II. These results indicate that the Alternative systems provide definite opportunities to lower cash operating costs. In at least some situations, there may be little or no sacrifice of net income by adopting Alternative systems. Further research will provide a better understanding of the full range of conditions under which the Alternative systems may be economically competitive.

Plans for On-going Research

The comparative profitability prospects of farming systems currently being studied at SDSU obviously could change with different yield and other assumptions. Sensitivity analyses now underway will provide insights on how different yield, fertilizer and herbicide, farm program, and other conditions affect the relative profitability of various farming systems. Yields will be monitored and enterprise budgets will be adjusted over time as SDSU's farming systems studies progress. The role of livestock enterprises in alternative farming systems is also receiving attention in the economic analyses. Results of this research hopefully will provide some keys to a more profitable agriculture--especially during times of low commodity prices and possibly reduced Federal farm program support.

Table 1. "Normalized" Yield Summary

Farming Systems Study I

	Yield (bu. or ton)/Acre				
	Corn	Soybeans	S.Wheat	Oats	Alfalfa
Alternative	75	28	n/a	70	3.6
Conventional	82	30	42	n/a	n/a
Ridge Till	84	31	42	n/a	n/a

Farming Systems Study II

	Yield (bu.)/Acre				
	Soybeans	S.Wheat	Oats	Barley	S.Clover
Alternative	27.5	40	70	n/a	Not harvested
Conventional	30	42	n/a	70	n/a
Minimum Till	30	42	n/a	65	n/a

Table 2. Results of Farming Systems Analyses Based upon "Normalized" Yields and Cropping Practices (1987 Farm Program and Price Assumptions)

System	Dollars/Acre				
	Direct Costs Other Than Labor	Gross Income	----- Net Income Over -----		
			All Costs Except Labor, and Management	All Costs Except Land and Management	All Costs Except Management
<u>Farming Systems Study I*</u>					
1. Alternative (soybeans-corn-oats-alfalfa)	42	121	49	36	10
2. Conventional (corn-soybeans-s. wheat)	63	143	54	45	19
3. Ridge Till (corn-soybeans-s. wheat)	65	145	58	51	25
<u>Farming Systems Study II*</u>					
1. Alternative (soybeans-s. wheat-oats-s. clover)	30	96	41	31	5
2. Conventional (soybeans-s. wheat-barley)	57	124	40	30	4
3. Minimum Till (soybeans-s. wheat-barley)	61	122	38	30	4

*Crops are shown in the order in which they occur in each rotation.

