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Profitability of Alternative Farming Systems at South Dakota State University's Northeast Research Station: 1989 Compared to Previous Transition Years

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**PROFITABILITY OF ALTERNATIVE FARMING
SYSTEMS AT SOUTH DAKOTA STATE
UNIVERSITY'S NORTHEAST RESEARCH
STATION: 1989 COMPARED TO
PREVIOUS TRANSITION YEARS**

by

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Research Report 90-1

January 1990

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PREFACE

This report is a companion to one released in mid-1989, **Economic Results of Alternative Farming Systems Trials at South Dakota State University's Northeast Research Station: 1985-1988**, Research Report 89-3 (SDSU Economics Department), by Clarence Mends, Thomas L. Dobbs, and James D. Smolik. Research leading to that report and to the present report received support from the South Dakota Agricultural Experiment Station and from U.S. Department of Agriculture Low-Input/Sustainable Agriculture (LISA) program competitive grants (No. LI-88-12 and No. LI-89-12). Future articles and reports emanating from this research will explore the implications of organic price premiums, higher chemical input prices, and changes in Federal farm policies for the relative profitability of conventional and alternative farming systems.

Thanks are expressed to Scott Van Der Werff for assistance with the crop enterprise budgets contained in this report. We also thank Professors James Smolik and Donald Taylor for reviewing this manuscript.

TLD and CM
January 1990

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PROFITABILITY OF ALTERNATIVE FARMING SYSTEMS
AT SOUTH DAKOTA STATE UNIVERSITY'S NORTHEAST
RESEARCH STATION: 1989 COMPARED TO PREVIOUS
TRANSITION YEARS

Introduction

South Dakota State University (SDSU) has been conducting a set of experiment station trials since 1985 in which particular "low-input" ("alternative") farming systems are compared with conventional and reduced tillage systems. The trials are conducted at SDSU's Northeast (NE) Research Station near Watertown. The first 4 years of yield and economic results were reported in a 95-page document by Mends, et al. (1989) several months ago. In this present report, economic results for 1989 are presented and are compared with those in the previous report.

Two studies are included in these trials at the NE Station, to represent different sets of crop combinations and rotations. Farming Systems Study I (FSS1) emphasizes row crops and includes Alternative, Conventional, and Ridge Till rotations. The crop combination and rotation for the Alternative system is oats/alfalfa-alfalfa-soybeans-corn. Commercial fertilizers and pesticides are not used in this system, nor is the moldboard plow used. Weeds are controlled primarily by mechanical cultivation, crop rotation effects, and some hand weeding of soybeans. The oats are harvested for grain and also serve as a nurse crop for alfalfa. The alfalfa is harvested for hay the year following seeding; the next year, the field is rotated to soybeans. The year after that, corn is planted. Corn, soybeans, and spring wheat, in that sequence, are included in both the Conventional and the Ridge Till systems. Commercial fertilizer and herbicides are used in both of these systems; products used and application rates are based on current SDSU Plant Science Department recommendations.

In Farming Systems Study II (FSS2), three systems with an emphasis on small grains are compared. The **Alternative** rotation consists of oats/clover-clover-soybeans-spring wheat. Oats are harvested and also act as a nurse crop for clover. The red clover-sweet clover mix currently used in this rotation serves as a green manure crop; it is not harvested, but rather, is mowed and chiseled. Since the clover is not harvested, the acreage devoted to it can satisfy some or all of the Federal farm program set-aside requirements in this rotation. No commercial fertilizers or pesticides are used in the **Alternative** rotation. **Conventional** and **Minimum Till** rotations in FSS2 contain soybeans, spring wheat, and barley, in that order. Commercial fertilizers and herbicides are used in these two systems, based upon soil tests and agronomic recommendations.

Enterprise budgeting procedures and input cost assumptions for 1985-1988 are described in Mends, et al. (1989). Those same procedures and assumptions apply to economic analyses of the 1989 crop.¹

Federal farm program assumptions, crop product selling prices, and Federal deficiency payment levels are shown in Table 1 for the years 1985 through 1989. The figures for 1985-1988 are essentially the same as previously presented in Mends, et al. (1989). They are repeated here for purposes of comparison to 1989.

Details of cultural practices and crop yields for each system in the years 1985-1988 are contained in Mends, et al. For 1989, they can be found in SDSU Plant Science Pamphlet No. 22 (1990).

¹After Mends, et al. (1989) was published, an error was found in calculations for direct costs and net income of the FSS2 minimum till system in 1986. Corrections for that error are reflected in figures shown in the present publication.

Table 1. Assumptions about Federal Farm Program and Market Prices used in the Budgets.

Crop	Year				
	1985	1986	1987	1988	1989
<u>Corn</u>					
Codington county loan rate (\$/bu.)	2.33	1.68	1.63	1.61	1.53
Target price (\$/bu.)	3.03	3.03	3.03	2.93	2.84
Acreage reduction program (%)	10.0	17.5	20.0	20.0	10.0
Deficiency payments (\$/bu.)	.48	1.11	1.09	.38*	.70*
Selling price (\$/bu.)	2.33	1.68	1.63	2.50*	2.05*
<u>Spring Wheat</u>					
Codington county loan rate (\$/bu.)	3.41	2.38	2.26	2.15	2.05
Target price (\$/bu.)	4.38	4.38	4.38	4.23	4.10
Acreage reduction program (%)	20.0	22.5	27.5	27.5	10.0
Deficiency payments (\$/bu.)	1.08	1.98	1.81	.58*	.30*
Selling price (\$/bu.)	3.41	2.42	2.53	3.95*	3.80*
<u>Oats</u>					
Codington county loan rate (\$/bu.)	1.21	.87	.90	.85	.81
Target price (\$/bu.)	1.60	1.60	1.60	1.55	1.50
Acreage reduction program (%)	10.0	17.5	20.0	5.0	5.0
Deficiency payments (\$/bu.)	.29	.39	.20	0*	0*
Selling price (\$/bu.)	1.21	1.28	1.60	2.60*	1.55*
<u>Barley</u>					
Codington county loan rate (\$/bu.)	2.00	1.45	1.35	1.34	1.22
Target price (\$/bu.)	2.60	2.60	2.60	2.51	2.43
Acreage reduction program (%)	10.0	17.5	20.0	20.0	10.0
Deficiency payments (\$/bu.)	.52	.99	.79	0*	.23*
Selling price (\$/bu.)	2.00	1.45	1.45	2.50*	1.80*
<u>Soybeans</u>					
Codington county loan rate (\$/bu.)	4.89	4.39	4.59	4.59*	4.25*
Selling price (\$/bu.)	4.89	4.58	5.15	7.65*	5.50*
<u>Alfalfa</u>					
Selling price (\$/ton)	47.00	32.00	36.00	70.00*	70.00*

*Estimates

Results

Economic results for the various systems in 1989 are presented first. Then, the results are compared to those of the previous 4 years for these systems.

1989 Results

Details of the enterprise budgets and whole farm analyses for each system are contained in the spread sheet tables of Annex A. Crop yields for 1989, used in gross returns calculations, are shown in the first row of each "Input Summary and Results" table. In comparing these yields with those in Mends, et al. (1989), note that yields recovered some in 1989, in comparison to levels during the severe drought conditions of 1988. However, yields in most cases were not at the levels of 1986 and 1987.

Commercial fertilizer and herbicide costs, if any, are shown along with other operating costs in the "direct costs" section in each of those "Input Summary..." tables.

On the page following the "Input Summary and Results" for each system are whole farm results, under the label "Summary Data for Representative Farm...". Farm program acreage set-aside requirements -- based upon 1989 Federal provisions and farmer participation at "minimum" levels -- are incorporated in the whole farm calculations.

Results from the tables of Annex A are summarized in Table 2. The first five columns of data indicate various cost and return measures for each system on a per acre basis. The last column indicates net income for each system on a whole farm basis, assuming a farm with 540 tillable acres.

The Alternative systems had the lowest "direct costs other than labor" and the lowest "gross income" per acre in both Study I and Study II in 1989.

Table 2. Results of Farming Systems Analyses Based upon 1989 Yields, Farm Program, and Prices.

System ¹	Dollars/Acre					Whole Farm, Net Income Over All Costs Except Management ² (\$)
	Direct Costs Other Than Labor	Gross Income	-----Net Income Over-----			
			All Costs Except Land, Labor, and Management	All Costs Except Land and Management	All Costs Except Management	
<u>Farming Systems Study I</u>						
1. Alternative (oats-alfalfa-soybeans-corn)	44	139	64	52	25	13,737
2. Conventional (corn-soybeans-s. wheat)	62	149	57	47	21	11,514
3. Ridge Till (corn-soybeans-s. wheat)	66	143	47	37	11	6,011
<u>Farming Systems Study II</u>						
1. Alternative (oats-clover-soybeans-s.wheat)	29	84	31	21	- 5	- 2,566
2. Conventional (soybeans-s. wheat-barley)	49	112	34	23	- 3	- 1,426
3. Minimum Till (soybeans s. wheat-barley)	52	101	21	11	-15	- 8,136

¹Crops are shown in the order in which they occur in each rotation.

²For farm with 540 tillable acres. Figures in this column are equivalent to 540 multiplied by "prerounded" figures in the "all costs except management" column.

Because of the very low corn yields in 1988 (FSS1), there was soil nutrient carryover into 1989. Therefore, it was not necessary to apply any commercial fertilizers to corn in the Conventional and Ridge Till systems of FSS1 during 1989 (the Alternative system never receives any commercial fertilizer). This was reflected in the 1989 "direct cost" calculations for these two systems.

All systems in FSS1 and FSS2 had positive net income "over all costs except land, labor, and management" and "over all costs except land and management" in 1989. When land charges were added, net income "over all costs except management" in 1989 were negative for all systems in FSS2 but were positive for all systems in FSS1.

One way to compare the profitability of the systems is to rank them by the "net income over all costs except management" (either per acre or per whole farm) criterion. The Alternative system performed best in 1989, by this criterion, in FSS1; the Conventional system was a close second and the Ridge Till system ranked last in FSS1 (see last two columns of Table 2).

In FSS2, on the other hand, the Conventional system ranked first, since it had the smallest net loss (\$3/acre or \$1,426/whole farm). The Alternative system was a close second in 1989 and the Minimum Till system ranked lowest, of the systems in FSS2 (Table 2).

Comparison to Previous Years

During 1989, the alternative farming system research trials at SDSU's NE Station were in the second year of the second rotation cycle for 3-year rotations and in the first year of the second rotation cycle for 4-year rotations. The 1985-1989 5-year period corresponds roughly to what might be considered a "transition period" for farmers who convert from "conventional" to "low-input/sustainable" (or "alternative") farming systems. Therefore, it

is useful to examine certain key economic indicators over that 5-year "transition" period. In making such a comparison, the least emphasis probably should be placed on the first year, 1985. Carryover effects (fertility, etc.) are likely to be greatest in that first year. Also, special costs are sometimes incurred in the first year of conversion, particularly in the special circumstances of experiment station trials [see cultural practices reported for 1985 in Mends, et al. (1989) for the **Alternative** systems].

Gross income comparisons: Crop yields and applicable market prices and/or Federal support payments were used in calculating the annual gross income for each system. Gross income comparisons for the farming systems in Studies I and II are shown in Figures 1 and 2. In 4 of the 5 years, the **Alternative** systems had the lowest gross income in both studies. The 1988 drought year was the exception. Gross income that year for the **Alternative** system in FSS1 was significantly higher than it was for the other two systems (Figure 1). The **Alternative** system gross income was nearly as high as that of the Ridge Till system in 1989. Drought year (1988) **Alternative** system corn yields were higher than **Conventional** and **Reduced Till** corn yields that year. Another major contributing factor to the higher "gross income" for the **Alternative** system in FSS1 was the drought-induced alfalfa prices. The \$70/ton alfalfa price used in the 1988 budgets was roughly double that used in the previous 2 years. High alfalfa prices continued in 1989, contributing to a relatively competitive FSS1 **Alternative** system gross income in that year, also. (However, alfalfa was the only crop, in either Study I or Study II, exhibiting lower yields in 1989 than in 1988.) Except for 1988 (when the **Alternative** system was higher) and 1985 (when the Ridge Till system was just

FSS1 Gross Income, 1985 - 1989

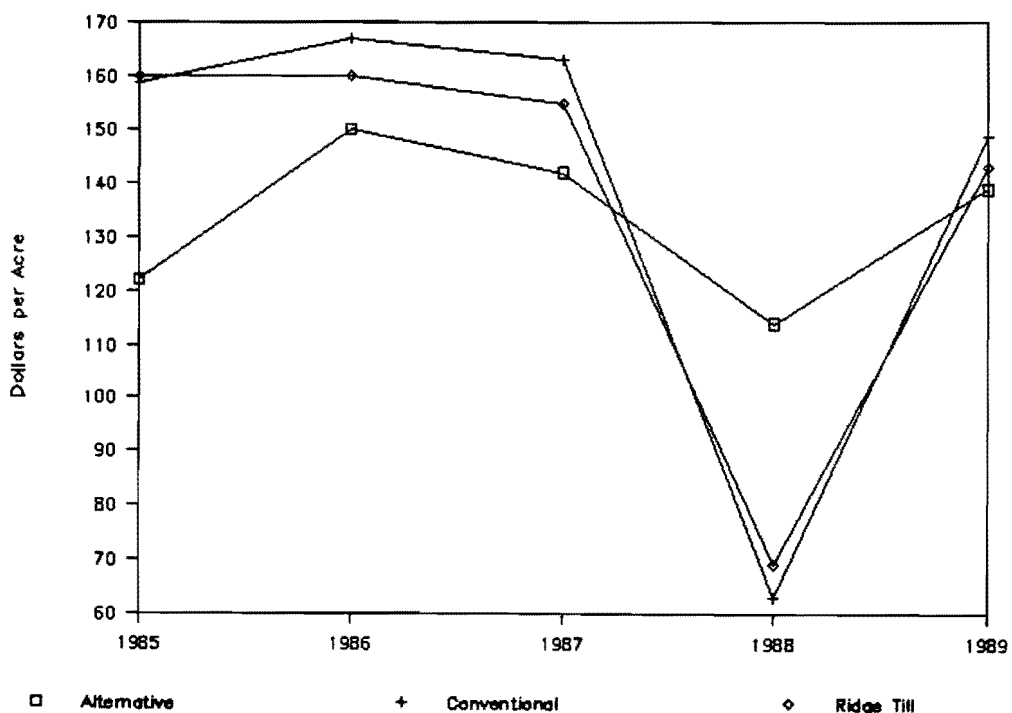


Figure 1. Gross Income Per Acre for the Three Systems in SDSU's Farming Systems Study I, Northeast Research Station.

FSS2 Gross Income, 1985 - 1989

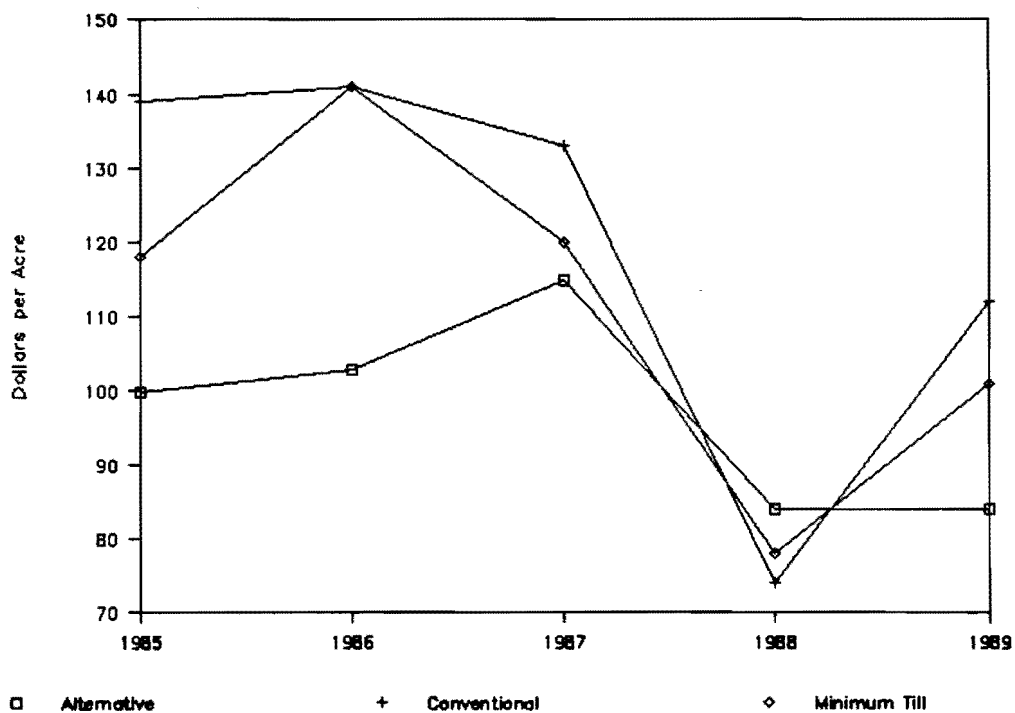


Figure 2. Gross Income Per Acre for the Three Systems in SDSU's Farming Systems Study II, Northeast Research Station.

slightly higher), the Conventional system had the highest gross income in FSS1 (Figure 1).

The Conventional system of FSS2 also had the highest gross income in most years (Figure 2). It was lowest in 1988 (the drought year) and had gross income just equal to that of the Minimum Till system in 1986. Contributing to the first place gross income ranking of the FSS2 Alternative system in 1988 were the following: (1) spring wheat in the Alternative system had a higher per bushel yield than did the Conventional and Minimum Till systems; and (2) the soybeans yield in the Alternative system was higher than for the Conventional system and it was nearly as high as the yield for the Minimum Till system. In 1989, Alternative system spring wheat yields again were the highest of the three systems in FSS2; Alternative system soybean yields that year were roughly the same as for the Minimum Till system but were lower than for the Conventional system (SDSU Plant Science Pamphlet No. 22).

Direct cost comparisons: Figures 3 and 4 show "direct costs other than labor" for each of the systems making up FSS1 and FSS2. The Alternative systems had by far the lowest direct (operating) costs in all years of the study. The Conventional systems had lower direct costs in most years than did the reduced tillage systems to which they were directly compared. Direct costs were lowest for all systems in 1988, the drought year.

Net income comparisons: "Net income over all costs except management" on a whole farm (540 tillable acres) basis is shown for the systems of FSS1 in Figure 5 and for the systems of FSS2 in Figure 6.

The Conventional system was the most profitable system (according to the "net income over all costs except management" criterion) in FSS1 during the first 3 years (1985-1987), but the Alternative system has been the most

FSS1 Direct Costs Other Than Labor,
1985 - 1989

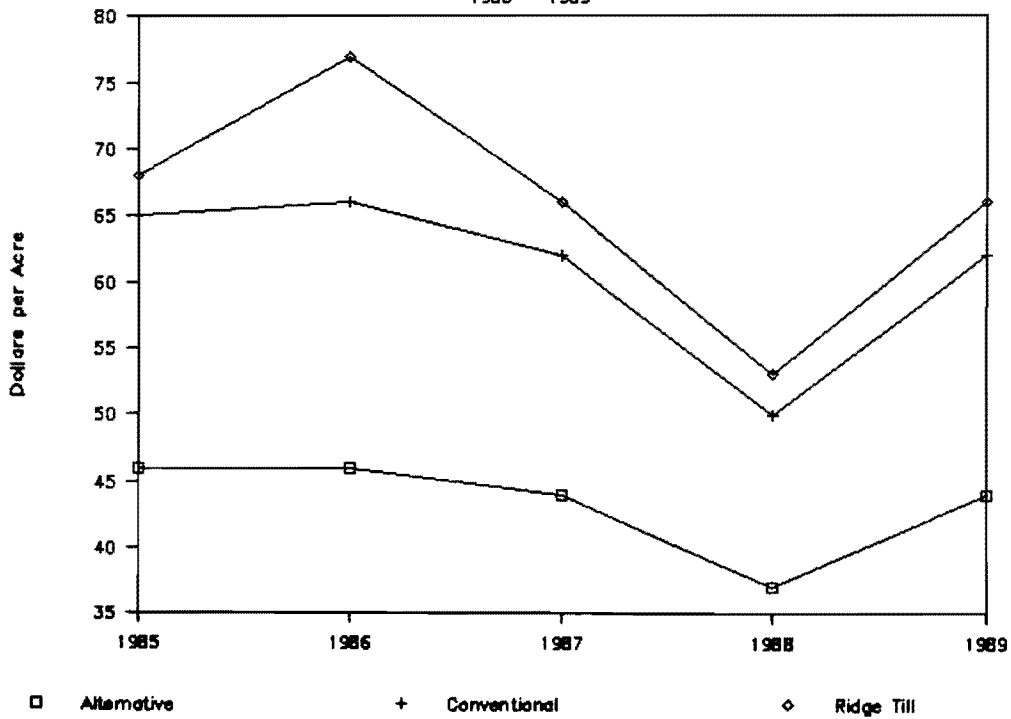


Figure 3. Direct Costs Per Acre for the Three Systems in SDSU's Farming Systems Study I, Northeast Research Station.

FSS2 Direct Costs Other Than Labor,
1985 - 1989

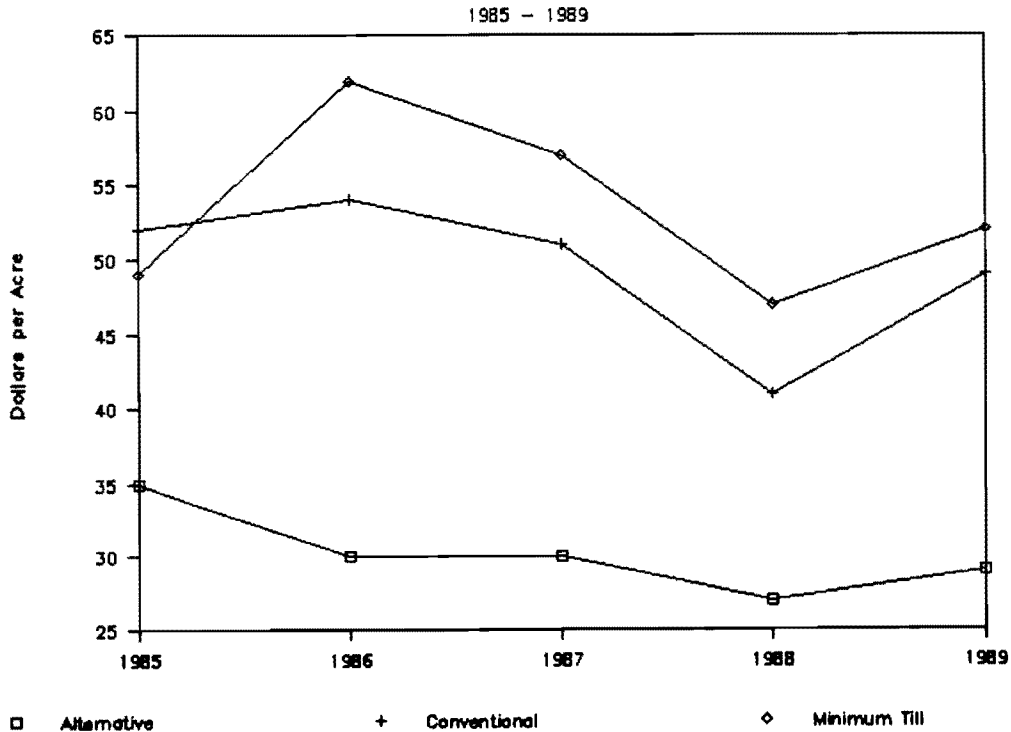


Figure 4. Direct Costs Per Acre for the Three Systems in SDSU's Farming Systems Study II, Northeast Research Station.

FSS1 Whole Farm Net Income, 1985 - 1989

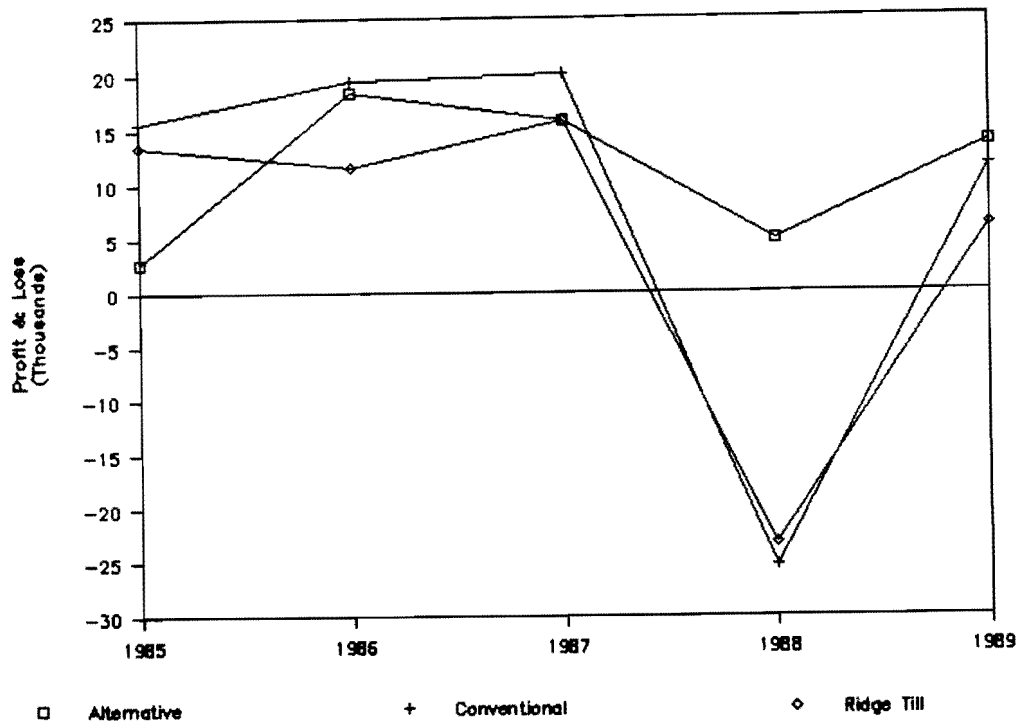


Figure 5. Whole Farm Net Income for the Three Systems in SDSU's Farming Systems Study I, Northeast Research Station.

FSS2 Whole Farm Net Income, 1985 - 1989

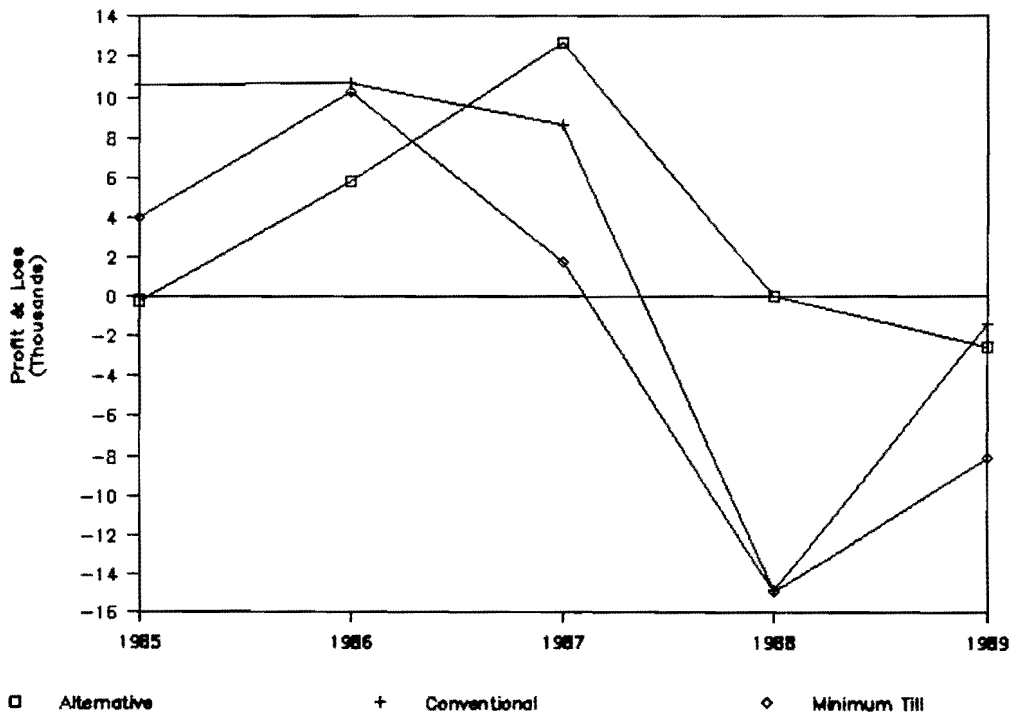


Figure 6. Whole Farm Net Income for the Three Systems in SDSU's Farming Systems Study II, Northeast Research Station.

profitable during the past 2 years (1988-1989). If we ignore the initial year (1985), we can say that the Conventional and the Alternative systems have each been most profitable half of the time. In 2 of the past 4 years, the Ridge Till system was the least profitable of the systems in FSS1. That system was roughly equal to the Alternative system in 1987 and was slightly higher than the Conventional system in 1988. All systems had positive net returns over the entire time period, except for 1988, when the Conventional and Ridge Till systems experienced net losses (ignoring drought disaster and crop insurance revenues).

Either the Conventional or the Alternative system has been most profitable every year in FSS2, also. After the first year, when the Conventional system was the most profitable, each has been most profitable half of the time -- the Conventional system in 1986 and 1989 and the Alternative system in 1987 and 1988. Actually, most systems in FSS2 experienced net losses in 1988 and 1989 (again, ignoring drought disaster and crop insurance revenues); the exception was the Alternative system, which roughly "broke even" in 1988. The Minimum Till system was the least profitable 2 of the past 3 years (it was approximately the same as the Conventional system in 1988). Yields for all systems were extremely low in 1988, and they only partially recovered in 1989. Some crop prices, especially for soybeans and oats, were quite a bit lower in 1989 than in 1988. These lower prices helped dampen net returns in 1989.

Conclusions

Whole-farm analyses of "low-input/sustainable" ("alternative") farming systems, based on 5 years of research trials, indicate that such systems are potentially competitive with more conventional systems under Northern Great

Plains agroclimatic conditions. The research trials at least partially confirm farmers' own experiences that a few years of "transition" may be necessary before systems are competitive economically. Also, the analyses presented here are consistent with other observations that sustainable systems may perform better than more conventional systems under drought conditions. Overall, net returns to sustainable systems, even in a transition period such as we studied here, appear to be less variable than are net returns to conventional systems. The analyses also illustrate that market conditions (e.g., the hay market in 1988 and 1989) can strongly impact economic outcomes. This also is true of Federal farm programs; results of analyses in which Federal crop support levels are varied will be reported elsewhere.

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- Mends, C., T.L. Dobbs, and J.D. Smolik. 1989. Economic Results of Alternative Farming System Trials at South Dakota State University's Northeast Research Station: 1985-1989. SDSU Economics Research Report 89-3, Brookings, SD. August.
- Plant Science Department. 1990. 1989 Annual Progress Report, Northeast Research Station, Watertown, South Dakota. SDSU Plant Science Pamphlet No. 22. Brookings, SD. January.

ANNEX A

**ENTERPRISE BUDGETS AND
WHOLE FARM RESULTS**

INPUT SUMMARY AND RESULTS--ALTERNATIVE ROTATION 1989 : FARMING SYSTEMS STUDY I

	Corn	Oats	Alfalfa	Soybean	Set Aside
RECEIPTS:					
Estimated grain yield (units/ac.).....	79	47	2.6	21	0
Estimated selling price or value (\$/unit)...	\$2.05	\$1.55	\$70.00	\$5.50	\$0.00
GOVERNMENT PAYMENT:					
Base yield (units/ac.).....	63	53	0	0	0
Deficiency payment (\$/unit).....	\$0.70	\$0.00	\$0.00	\$0.00	\$0.00
I. Total income per acre.....	\$206.05	\$72.08	\$184.80	\$113.30	\$0.00
DIRECT COSTS:					
Seed (\$/ac.).....	\$13.88	\$26.06	\$0.00	\$8.50	\$0.00
Fertilizer (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fertilizer application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Herbicide (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Herbicide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Crop insurance (\$/ac.).....	\$13.71	\$1.26	\$0.00	\$3.05	\$0.00
Storage (\$/ac.).....	\$8.77	\$5.16	\$0.00	\$2.29	\$0.00
Drying (\$/ac.).....	\$11.85	\$0.00	\$0.00	\$0.00	\$0.00
Overhead (\$/ac.).....	\$5.50	\$5.00	\$5.00	\$5.50	\$2.50
Custom machine hire (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fuel and lubrication (\$/ac.).....	\$4.43	\$4.51	\$4.07	\$3.55	\$1.53
Machinery repair (\$/ac.).....	\$8.49	\$13.96	\$10.00	\$7.21	\$1.25
Interest on non labor direct costs (\$/ac.)...	\$3.94	\$3.31	\$1.13	\$1.78	\$0.31
Labor charge(\$/ac.).....	\$10.50	\$11.28	\$11.94	\$16.68	\$2.42
II. Total direct (operating) costs.....	\$81.07	\$70.54	\$32.14	\$48.56	\$8.01
Income over direct costs (I minus II)....	\$124.98	\$1.53	\$152.66	\$64.74	(\$8.01)
Breakeven price per unit (direct costs)..	\$1.03	\$1.52	\$12.17	\$2.36	ERR
FIXED COSTS:					
Interest, Housing & Ins. on machinery (\$/ac)	\$15.68	\$15.80	\$15.24	\$13.65	\$2.40
Deprec. on machinery and equipment (\$/ac.)..	\$17.15	\$17.64	\$16.90	\$15.21	\$2.19
Real estate taxes (\$/ac.).....	\$5.25	\$5.25	\$5.25	\$5.25	\$5.25
III. Total fixed costs.....	\$38.08	\$38.69	\$37.39	\$34.11	\$9.84
IV. Production costs (\$/ac., excluding land)	\$119.15	\$109.23	\$69.53	\$82.67	\$17.85
(II plus III)					
Production costs (\$/unit)...	\$1.51	\$2.35	\$26.34	\$4.01	ERR
V. Land charges (\$/ac.).....	\$21.00	\$21.00	\$21.00	\$21.00	\$21.00
VI. Total production and land costs (\$/ac.)	\$140.15	\$130.23	\$90.53	\$103.67	\$38.85
(IV plus V)					
Production and land costs (\$/unit).....	\$1.77	\$2.80	\$34.29	\$5.03	ERR
Breakeven yield (units/ac.).....	68.4	84.0	1.3	18.8	ERR
(at selling price)					
VII. Income over all costs (\$/acre).....	\$65.90	(\$58.16)	\$94.27	\$9.63	(\$38.85)
(I minus VI)					
Income over all costs (\$/unit).....	\$0.83	(\$1.25)	\$35.71	\$0.47	ERR

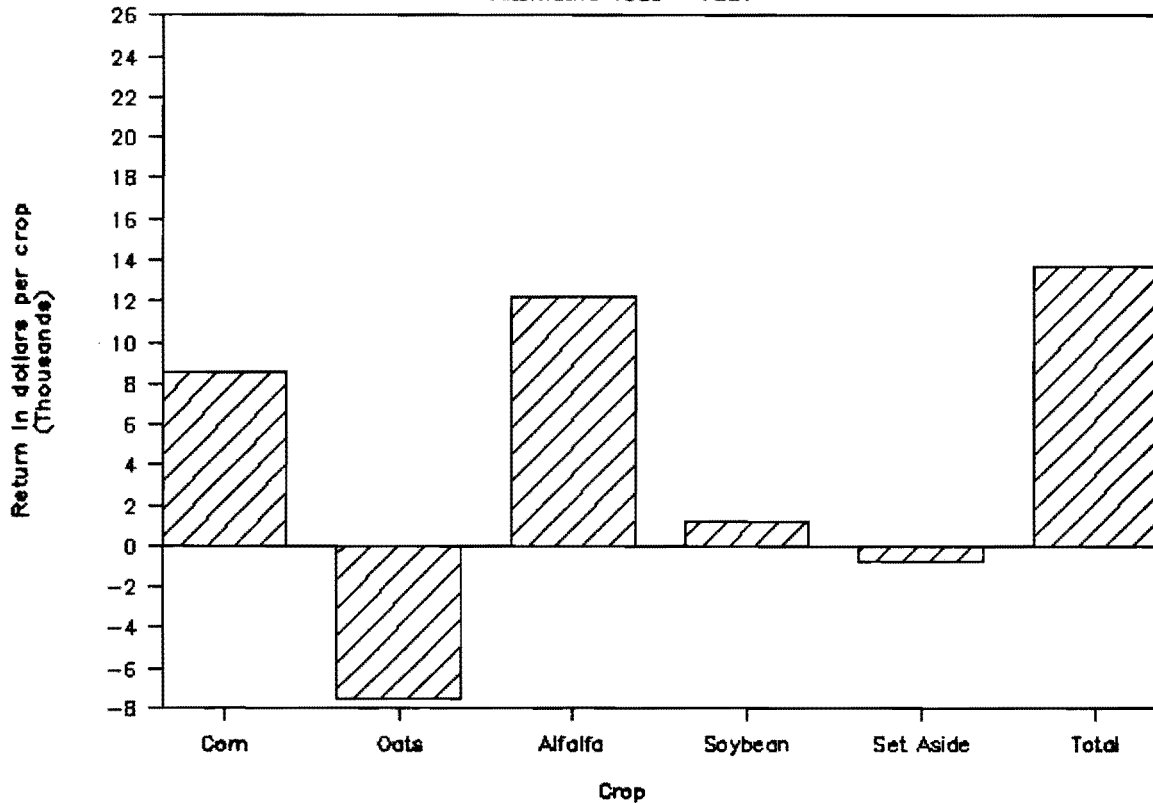
ALTERNATIVE ROTATION 1989 : FARMING SYSTEMS STUDY I
 SUMMARY DATA FOR REPRESENTATIVE FARM IN NORTHEAST SOUTH DAKOTA.

	Corn	Oats	Alfalfa	Soybean	Set Aside	Total
Farm Program Set-aside Requirement (%).....	10	5	0	0	0	
Crop Distribution (acres)..	130.0	130.0	130.0	130.0	20.0	540
Income Over All Costs..... (\$/acre)	\$65.90	(\$58.16)	\$94.27	\$9.63	(\$38.85)	
Income Over All Costs..... (\$/crop)	\$8,567	(\$7,560)	\$12,255	\$1,252	(\$777)	\$13,737

Dollars/acre				
Gross Income	Direct costs (excl. labor)	Income over non-labor & non-land costs	Inc. over non-land costs	Inc. over all costs
\$139	\$44	\$64	\$52	\$25

Income Over All Costs

Alternative 1989 - FSS1



INPUT SUMMARY AND RESULTS: CONVENTIONAL ROTATION 1989 --FARMING SYSTEMS STUDY I

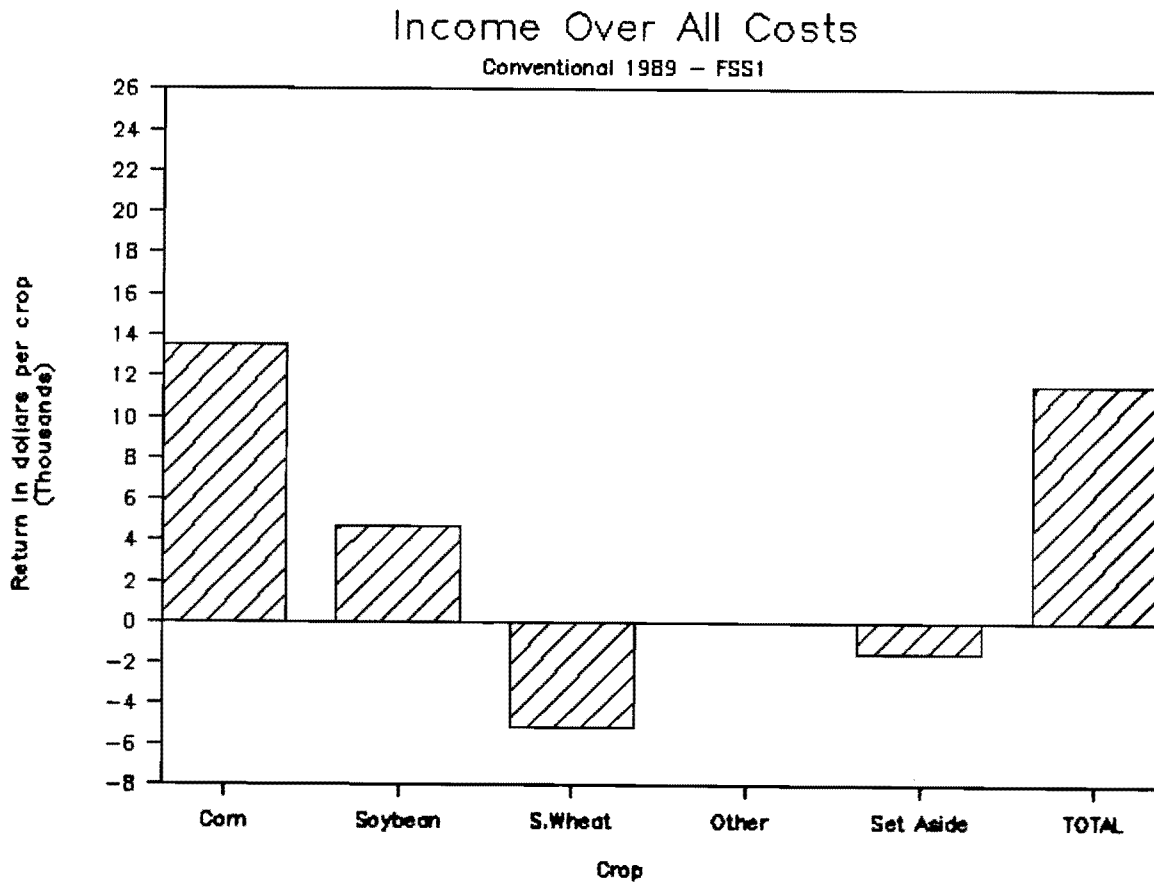
	Corn	Soybean	S.Wheat	Other	Set Aside
RECEIPTS:					
Estimated grain yield (units/ac.).....	90	25	29	0	0
Estimated selling price or value (\$/unit)...	\$2.05	\$5.50	\$3.80	\$0.00	\$0.00
GOVERNMENT PAYMENT:					
Base yield (units/ac.).....	63	0	27	0	0
Deficiency payment (\$/unit).....	\$0.70	\$0.00	\$0.30	\$0.00	\$0.00
I. Total income per acre.....	\$227.99	\$134.75	\$117.54	\$0.00	\$0.00
DIRECT COSTS:					
Seed (\$/ac.).....	\$13.88	\$8.50	\$7.58	\$0.00	\$0.00
Fertilizer (\$/ac.).....	\$0.00	\$0.00	\$24.30	\$0.00	\$0.00
Fertilizer application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Herbicide (\$/ac.).....	\$5.95	\$5.04	\$17.84	\$0.00	\$4.15
Herbicide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Crop insurance (\$/ac.).....	\$15.57	\$3.63	\$2.62	\$0.00	\$0.00
Storage (\$/ac.).....	\$9.96	\$2.72	\$3.20	\$0.00	\$0.00
Drying (\$/ac.).....	\$13.46	\$0.00	\$0.00	\$0.00	\$0.00
Overhead (\$/ac.).....	\$5.50	\$5.50	\$5.00	\$0.00	\$2.50
Custom machine hire (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fuel and lubrication (\$/ac.).....	\$4.07	\$3.33	\$4.78	\$0.00	\$1.12
Machinery repair (\$/ac.).....	\$8.15	\$7.17	\$10.05	\$0.00	\$1.00
Interest on non labor direct costs (\$/ac)...	\$4.53	\$2.12	\$4.46	\$0.00	\$0.52
Labor charge(\$/ac.).....	\$9.18	\$13.32	\$9.72	\$0.00	\$2.12
II. Total direct (operating) costs.....	\$90.23	\$51.33	\$89.55	\$0.00	\$11.42
Income over direct costs (I minus II)....	\$137.75	\$83.42	\$27.99	\$0.00	(\$11.42)
Breakeven price per unit (direct costs)..	\$1.01	\$2.10	\$3.11	ERR	ERR
FIXED COSTS:					
Interest, Housing & Ins. on machinery (\$/ac)	\$14.79	\$13.67	\$15.67	\$0.00	\$1.85
Deprec. on machinery and equipment (\$/ac.)..	\$16.33	\$15.44	\$17.13	\$0.00	\$1.75
Real estate taxes (\$/ac.).....	\$5.25	\$5.25	\$5.25	\$0.00	\$5.25
III. Total fixed costs.....	\$36.37	\$34.36	\$38.05	\$0.00	\$8.85
IV. Production costs (\$/ac., excluding land) (II plus III)	\$126.60	\$85.69	\$127.60	\$0.00	\$20.27
Production costs (\$/unit)...	\$1.41	\$3.50	\$4.43	ERR	ERR
V. Land charges (\$/ac.).....	\$21.00	\$21.00	\$21.00	\$0.00	\$21.00
VI. Total production and land costs (\$/ac.) (IV plus V)	\$147.60	\$106.69	\$148.60	\$0.00	\$41.27
Production and land costs (\$/unit).....	\$1.65	\$4.35	\$5.16	ERR	ERR
Breakeven yield (units/ac.).....	72.0	19.4	39.1	ERR	ERR
(at selling price)					
VII. Income over all costs (\$/acre)..... (I minus VI)	\$80.38	\$28.06	(\$31.06)	\$0.00	(\$41.27)
Income over all costs (\$/unit).....	\$0.90	\$1.15	(\$1.08)	ERR	ERR

CONVENTIONAL ROTATION 1989 : FARMING SYSTEMS STUDY I
 SUMMARY DATA FOR REPRESENTATIVE FARM IN NORTHEAST SOUTH DAKOTA.

	Corn	Soybean	S.Wheat	Other	Set Aside	TOTAL FARM
Farm Program Set-aside Requirement (%).....	10	0	10	0	0	
Crop Distribution (acres)..	168.0	168.0	168.0	0	36.0	540
Income Over All Costs..... (\$/acre)	\$80.38	\$28.06	(\$31.06)	\$0.00	(\$41.27)	
Income Over All Costs..... (\$/crop)	\$13,504	\$4,713	(\$5,218)	\$0	(\$1,486)	\$11,514

Dollars/acre

Gross Income	Direct costs (excl. labor)	Income over non-labor & non-land costs	Inc. over non-land costs	Inc. over all costs
\$149	\$62	\$57	\$47	\$21



INPUT SUMMARY AND RESULTS--RIDGE TILL ROTATION 1989 : FARMING SYSTEMS STUDY I

	Corn	Soybean	S. Wheat	Other	Set Aside
RECEIPTS:					
Estimated grain yield (units/ac.).....	87	23	27	0	0
Estimated selling price or value (\$/unit)...	\$2.05	\$5.50	\$3.80	\$0.00	\$0.00
GOVERNMENT PAYMENT:					
Base yield (units/ac.).....	63	0	27	0	0
Deficiency payment (\$/unit).....	\$0.70	\$0.00	\$0.30	\$0.00	\$0.00
I. Total income per acre.....	\$222.66	\$127.05	\$108.80	\$0.00	\$0.00
DIRECT COSTS:					
Seed (\$/ac.).....	\$13.88	\$8.50	\$7.58	\$0.00	\$0.00
Fertilizer (\$/ac.).....	\$0.00	\$0.00	\$24.30	\$0.00	\$0.00
Fertilizer application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Herbicide (\$/ac.).....	\$5.95	\$19.83	\$17.84	\$0.00	\$4.15
Herbicide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Crop insurance (\$/ac.).....	\$15.12	\$3.42	\$2.41	\$0.00	\$0.00
Storage (\$/ac.).....	\$9.67	\$2.56	\$2.94	\$0.00	\$0.00
Drying (\$/ac.).....	\$13.07	\$0.00	\$0.00	\$0.00	\$0.00
Overhead (\$/ac.).....	\$5.50	\$5.50	\$5.00	\$0.00	\$2.50
Custom machine hire (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fuel and lubrication (\$/ac.).....	\$4.43	\$3.21	\$4.07	\$0.00	\$1.12
Machinery repair (\$/ac.).....	\$8.48	\$6.82	\$9.40	\$0.00	\$1.00
Interest on non labor direct costs (\$/ac.)...	\$4.50	\$2.95	\$4.35	\$0.00	\$0.52
Labor charge(\$/ac.).....	\$8.28	\$14.14	\$8.58	\$0.00	\$2.12
II. Total direct (operating) costs.....	\$88.87	\$66.93	\$86.48	\$0.00	\$11.41
Income over direct costs (I minus II)....	\$133.79	\$60.12	\$22.32	\$0.00	(\$11.41)
Breakeven price per unit (direct costs)..	\$1.02	\$2.90	\$3.26	ERR	ERR
FIXED COSTS:					
Interest, Housing & Ins. on machinery (\$/ac)	\$15.78	\$13.45	\$14.93	\$0.00	\$1.85
Deprec. on machinery and equipment (\$/ac.)..	\$17.11	\$15.05	\$16.54	\$0.00	\$1.75
Real estate taxes (\$/ac.).....	\$5.25	\$5.25	\$5.25	\$0.00	\$5.25
III. Total fixed costs.....	\$38.14	\$33.75	\$36.72	\$0.00	\$8.85
IV. Production costs (\$/ac., excluding land)	\$127.01	\$100.68	\$123.20	\$0.00	\$20.26
(II plus III)					
Production costs (\$/unit)...	\$1.46	\$4.36	\$4.65	ERR	ERR
V. Land charges (\$/ac.).....	\$21.00	\$21.00	\$21.00	\$0.00	\$21.00
VI. Total production and land costs (\$/ac.)	\$148.01	\$121.68	\$144.20	\$0.00	\$41.26
(IV plus V)					
Production and land costs (\$/unit).....	\$1.70	\$5.27	\$5.44	ERR	ERR
Breakeven yield (units/ac.).....	72.2	22.1	37.9	ERR	ERR
(at selling price)					
VII. Income over all costs (\$/acre).....	\$74.65	\$5.37	(\$35.40)	\$0.00	(\$41.26)
(I minus VI)					
Income over all costs (\$/unit).....	\$0.86	\$0.23	(\$1.34)	ERR	ERR

RIDGE TILL ROTATION 1989 : FARMING SYSTEMS STUDY I
 SUMMARY DATA FOR REPRESENTATIVE FARM IN NORTHEAST SOUTH DAKOTA.

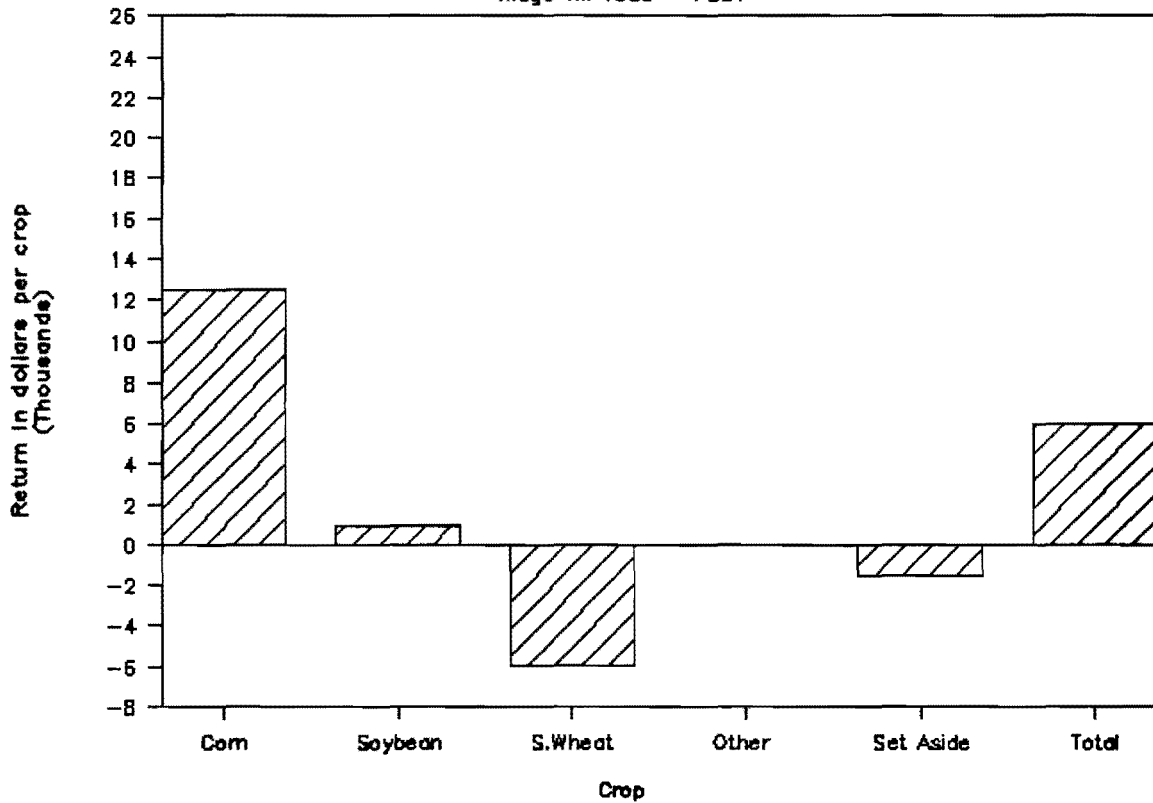
	Corn	Soybean	S.Wheat	Other	Set Aside	Total
Farm Program Set-aside Requirement (%).....	10	0	10	0	0	
Crop Distribution (acres)..	168.0	168.0	168.0	0	36.0	540
Income Over All Costs..... (\$/acre)	\$74.65	\$5.37	(\$35.40)	\$0.00	(\$41.26)	
Income Over All Costs..... (\$/crop)	\$12,541	\$902	(\$5,947)	\$0	(\$1,485)	\$6,011

Dollars/acre

Gross Income	Direct costs (excl. labor)	Income over non-labor & non-land costs	Inc. over non-land costs	Inc. over all costs
\$143	\$66	\$47	\$37	\$11

Income Over All Costs

Ridge Till 1989 - FSS1



INPUT SUMMARY AND RESULTS-- ALTERNATIVE ROTATION 1989 : Farming Systems Study II

	Oats	S.Clover	Soybean	S.Wheat	Set Aside
RECEIPTS:					
Estimated grain yield (units/ac.).....	50	0.6	25	30	0
Estimated selling price or value (\$/unit)...	\$1.55	\$0.00	\$5.50	\$3.80	\$0.00
GOVERNMENT PAYMENT:					
Base yield (units/ac.).....	53	0	0	27	0
Deficiency payment (\$/unit).....	\$0.00	\$0.00	\$0.00	\$0.30	\$0.00
I. Total income per acre.....	\$78.12	\$0.00	\$135.30	\$122.10	\$0.00
DIRECT COSTS:					
Seed (\$/ac.).....	\$12.79	\$0.00	\$8.50	\$7.56	\$0.00
Fertilizer (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fertilizer application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Herbicide (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Herbicide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Crop insurance (\$/ac.).....	\$1.36	\$0.00	\$3.65	\$2.73	\$0.00
Storage (\$/ac.).....	\$5.59	\$0.00	\$2.73	\$3.33	\$0.00
Drying (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Overhead (\$/ac.).....	\$5.00	\$4.00	\$5.50	\$5.00	\$0.00
Custom machine hire (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fuel and lubrication (\$/ac.).....	\$2.68	\$1.33	\$4.18	\$4.79	\$0.00
Machinery repair (\$/ac.).....	\$8.49	\$1.68	\$7.83	\$9.88	\$0.00
Interest on non labor direct costs (\$/ac.)...	\$2.13	\$0.41	\$1.92	\$1.97	\$0.00
Labor charge(\$/ac.).....	\$7.20	\$3.06	\$21.20	\$9.18	\$0.00
II. Total direct (operating) costs.....	\$45.24	\$10.48	\$55.50	\$44.44	\$0.00
Income over direct costs (I minus II)....	\$32.88	(\$10.48)	\$79.80	\$77.66	\$0.00
Breakeven price per unit (direct costs)..	\$0.90	\$17.19	\$2.26	\$1.48	ERR
FIXED COSTS:					
Interest, Housing & Ins. on machinery (\$/ac)	\$12.20	\$2.44	\$14.69	\$15.24	\$0.00
Deprec. on machinery and equipment (\$/ac.)..	\$14.10	\$2.39	\$16.27	\$16.53	\$0.00
Real estate taxes (\$/ac.).....	\$5.25	\$5.25	\$5.25	\$5.25	\$0.00
III. Total fixed costs.....	\$31.55	\$10.08	\$36.21	\$37.02	\$0.00
IV. Production costs (\$/ac., excluding land) (II plus III)	\$76.79	\$20.56	\$91.71	\$81.46	\$0.00
Production costs (\$/unit)...	\$1.52	\$33.71	\$3.73	\$2.72	ERR
V. Land charges (\$/ac.).....	\$21.00	\$21.00	\$21.00	\$21.00	\$0.00
VI. Total production and land costs (\$/ac.) (IV plus V)	\$97.79	\$41.56	\$112.71	\$102.46	\$0.00
Production and land costs (\$/unit).....	\$1.94	\$68.14	\$4.58	\$3.42	ERR
Breakeven yield (units/ac.).....	63.1	ERR	20.5	27.0	ERR
(at selling price)					
VII. Income over all costs (\$/acre)..... (I minus VI)	(\$19.67)	(\$41.56)	\$22.59	\$19.64	\$0.00
Income over all costs (\$/unit).....	(\$0.39)	(\$68.14)	\$0.92	\$0.65	ERR

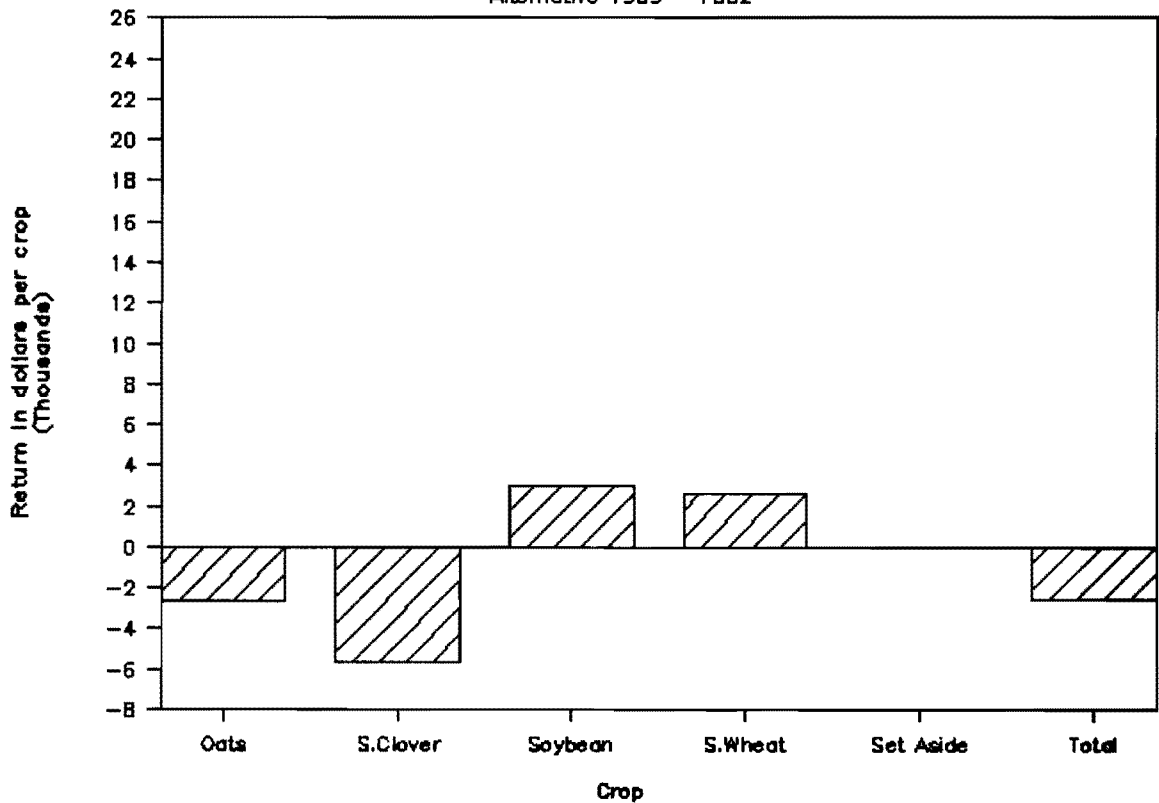
ALTERNATIVE ROTATION 1989 : FARMING SYSTEMS STUDY II
 SUMMARY DATA FOR REPRESENTATIVE FARM IN NORTHEAST SOUTH DAKOTA.

	Oats	S.Clover	Soybean	S.Wheat	Set Aside	Total
Farm Program Set-aside Requirement (%).....	5	0	0	10	0	
Crop Distribution (acres)..	135.0	135.0	135.0	135.0	0	540
Income Over All Costs..... (\$/acre)	(\$19.67)	(\$41.56)	\$22.59	\$19.64	\$0.00	
Income Over All Costs..... (\$/crop)	(\$2,655)	(\$5,611)	\$3,049	\$2,651	\$0	(\$2,566)

Dollars/acre				
Gross Income	Direct costs (excl. labor)	Income over non-labor & non-land costs	Inc. over non-land costs	Inc. over all costs
\$84	\$29	\$31	\$21	(\$5)

Income Over All Costs

Alternative 1989 - FSS2



INPUT SUMMARY AND RESULTS--CONVENTIONAL ROTATION 1989 : FARMING SYSTEMS STUDY II

	Barley	Soybean	S. Wheat	Other	Set Aside
RECEIPTS:					
Estimated grain yield (units/ac.).....	47	27	28	0	0
Estimated selling price or value (\$/unit)...	\$1.80	\$5.50	\$3.80	\$0.00	\$0.00
GOVERNMENT PAYMENT:					
Base yield (units/ac.).....	41	0	27	0	0
Deficiency payment (\$/unit).....	\$0.23	\$0.00	\$0.30	\$0.00	\$0.00
I. Total income per acre.....	\$94.03	\$149.05	\$115.64	\$0.00	\$0.00
DIRECT COSTS:					
Seed (\$/ac.).....	\$4.06	\$8.50	\$7.56	\$0.00	\$0.00
Fertilizer (\$/ac.).....	\$3.60	\$0.00	\$18.00	\$0.00	\$0.00
Fertilizer application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Herbicide (\$/ac.).....	\$6.04	\$5.04	\$17.84	\$0.00	\$4.15
Herbicide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Crop insurance (\$/ac.).....	\$2.44	\$4.02	\$2.58	\$0.00	\$0.00
Storage (\$/ac.).....	\$5.22	\$3.01	\$3.14	\$0.00	\$0.00
Drying (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Overhead (\$/ac.).....	\$5.00	\$5.50	\$5.00	\$0.00	\$2.50
Custom machine hire (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fuel and lubrication (\$/ac.).....	\$4.76	\$2.92	\$4.78	\$0.00	\$1.12
Machinery repair (\$/ac.).....	\$10.10	\$6.70	\$10.04	\$0.00	\$1.00
Interest on non labor direct costs (\$/ac.)...	\$2.44	\$2.11	\$4.08	\$0.00	\$0.52
Labor charge(\$/ac.).....	\$9.78	\$14.08	\$9.72	\$0.00	\$2.10
II. Total direct (operating) costs.....	\$53.44	\$51.88	\$82.74	\$0.00	\$11.39
Income over direct costs (I minus II)....	\$40.59	\$97.17	\$32.90	\$0.00	(\$11.39)
Breakeven price per unit (direct costs)..	\$1.14	\$1.91	\$2.92	ERR	ERR
FIXED COSTS:					
Interest, Housing & Ins. on machinery (\$/ac)	\$15.37	\$12.38	\$15.66	\$0.00	\$1.85
Deprec. on machinery and equipment (\$/ac.)..	\$16.84	\$14.20	\$17.12	\$0.00	\$1.75
Real estate taxes (\$/ac.).....	\$5.25	\$5.25	\$5.25	\$0.00	\$5.25
III. Total fixed costs.....	\$37.46	\$31.83	\$38.03	\$0.00	\$8.85
IV. Production costs (\$/ac., excluding land) (II plus III)	\$90.90	\$83.71	\$120.77	\$0.00	\$20.24
Production costs (\$/unit)...	\$1.93	\$3.09	\$4.27	ERR	ERR
V. Land charges (\$/ac.).....	\$21.00	\$21.00	\$21.00	\$0.00	\$21.00
VI. Total production and land costs (\$/ac.) (IV plus V)	\$111.90	\$104.71	\$141.77	\$0.00	\$41.24
Production and land costs (\$/unit).....	\$2.38	\$3.86	\$5.01	ERR	ERR
Breakeven yield (units/ac.)..... (at selling price)	62.2	19.0	37.3	ERR	ERR
VII. Income over all costs (\$/acre)..... (I minus VI)	(\$17.87)	\$44.34	(\$26.13)	\$0.00	(\$41.24)
Income over all costs (\$/unit).....	(\$0.38)	\$1.64	(\$0.92)	ERR	ERR

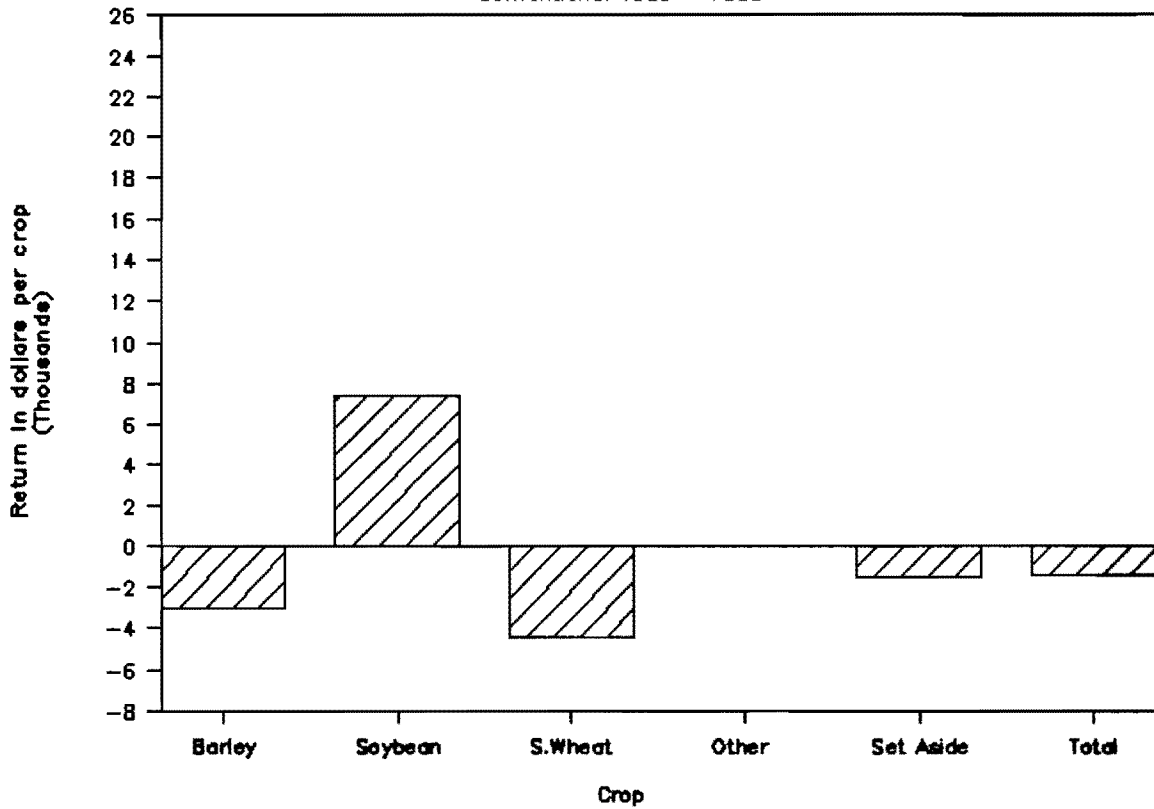
CONVENTIONAL ROTATION 1989 : FARMING SYSTEMS STUDY II
 SUMMARY DATA FOR REPRESENTATIVE FARM IN NORTHEAST SOUTH DAKOTA.

	Barley	Soybean	S.Wheat	Other	Set Aside	Total
Farm Program Set-aside Requirement (%).....	10	0	10	0	0	
Crop Distribution (acres)..	168.0	168.0	168.0	0	36.0	540
Income Over All Costs..... (\$/acre)	(\$17.87)	\$44.34	(\$26.13)	\$0.00	(\$41.24)	
Income Over All Costs..... (\$/crop)	(\$3,002)	\$7,450	(\$4,389)	\$0	(\$1,485)	(\$1,426)

Dollars/acre				
Gross Income	Direct costs (excl. labor)	Income over non-labor & non-land costs	Inc. over non-land costs	Inc. over all costs
\$112	\$49	\$34	\$23	(\$3)

Income Over All Costs

Conventional 1989 - FSS2



INPUT SUMMARY AND RESULTS--MINIMUM TILL ROTATION 1989 : FARMING SYSTEMS STUDY II

	Barley	Soybean	S. Wheat	Other	Set Aside
RECEIPTS:					
Estimated grain yield (units/ac.).....	39	24	27	0	0
Estimated selling price or value (\$/unit)...	\$1.80	\$5.50	\$3.80	\$0.00	\$0.00
GOVERNMENT PAYMENT:					
Base yield (units/ac.).....	41	0	27	0	0
Deficiency payment (\$/unit).....	\$0.23	\$0.00	\$0.30	\$0.00	\$0.00
I. Total income per acre.....	\$78.73	\$133.10	\$111.84	\$0.00	\$0.00
DIRECT COSTS:					
Seed (\$/ac.).....	\$4.06	\$8.50	\$7.56	\$0.00	\$0.00
Fertilizer (\$/ac.).....	\$3.60	\$0.00	\$24.30	\$0.00	\$0.00
Fertilizer application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Herbicide (\$/ac.).....	\$6.04	\$16.17	\$17.84	\$0.00	\$4.15
Herbicide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Insecticide application (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Crop insurance (\$/ac.).....	\$2.00	\$3.59	\$2.48	\$0.00	\$0.00
Storage (\$/ac.).....	\$4.27	\$2.69	\$3.03	\$0.00	\$0.00
Drying (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Overhead (\$/ac.).....	\$5.00	\$5.50	\$5.00	\$0.00	\$2.50
Custom machine hire (\$/ac.).....	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fuel and lubrication (\$/ac.).....	\$3.88	\$3.22	\$3.76	\$0.00	\$1.12
Machinery repair (\$/ac.).....	\$8.95	\$6.83	\$9.03	\$0.00	\$1.00
Interest on non labor direct costs (\$/ac.)...	\$2.24	\$2.75	\$4.32	\$0.00	\$0.52
Labor charge(\$/ac.).....	\$8.34	\$14.97	\$7.92	\$0.00	\$2.10
II. Total direct (operating) costs.....	\$48.38	\$64.21	\$85.24	\$0.00	\$11.39
Income over direct costs (I minus II)....	\$30.35	\$68.89	\$26.60	\$0.00	(\$11.39)
Breakeven price per unit (direct costs)..	\$1.26	\$2.65	\$3.12	ERR	ERR
FIXED COSTS:					
Interest, Housing & Ins. on machinery (\$/ac)	\$13.76	\$13.46	\$13.76	\$0.00	\$1.85
Deprec. on machinery and equipment (\$/ac.)..	\$15.39	\$15.07	\$15.23	\$0.00	\$1.75
Real estate taxes (\$/ac.).....	\$5.25	\$5.25	\$5.25	\$0.00	\$5.25
III. Total fixed costs.....	\$34.40	\$33.78	\$34.24	\$0.00	\$8.85
IV. Production costs (\$/ac., excluding land) (II plus III)	\$82.78	\$97.99	\$119.48	\$0.00	\$20.24
Production costs (\$/unit)...	\$2.15	\$4.05	\$4.38	ERR	ERR
V. Land charges (\$/ac.).....	\$21.00	\$21.00	\$21.00	\$0.00	\$21.00
VI. Total production and land costs (\$/ac.) (IV plus V)	\$103.78	\$118.99	\$140.48	\$0.00	\$41.24
Production and land costs (\$/unit).....	\$2.70	\$4.92	\$5.15	ERR	ERR
Breakeven yield (units/ac.).....	57.7	21.6	37.0	ERR	ERR
(at selling price)					
VII. Income over all costs (\$/acre)..... (I minus VI)	(\$25.05)	\$14.11	(\$28.64)	\$0.00	(\$41.24)
Income over all costs (\$/unit).....	(\$0.65)	\$0.58	(\$1.05)	ERR	ERR

MINIMUM TILL ROTATION 1989 : FARMING SYSTEMS STUDY II
 SUMMARY DATA FOR REPRESENTATIVE FARM IN NORTHEAST SOUTH DAKOTA.

	Barley	Soybean	S.Wheat	Other	Set Aside	Total
Farm Program Set-aside Requirement (%).....	10	0	10	0	0	
Crop Distribution (acres)..	168.0	168.0	168.0	0	36.0	540
Income Over All Costs..... (\$/acre)	(\$25.05)	\$14.11	(\$28.64)	\$0.00	(\$41.24)	
Income Over All Costs..... (\$/crop)	(\$4,209)	\$2,370	(\$4,812)	\$0	(\$1,485)	(\$8,136)

Dollars/acre

Gross Income	Direct costs (excl. labor)	Income over non-labor & non-land costs	Inc. over non-land costs	Inc. over all costs
\$101	\$52	\$21	\$11	(\$15)

