AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

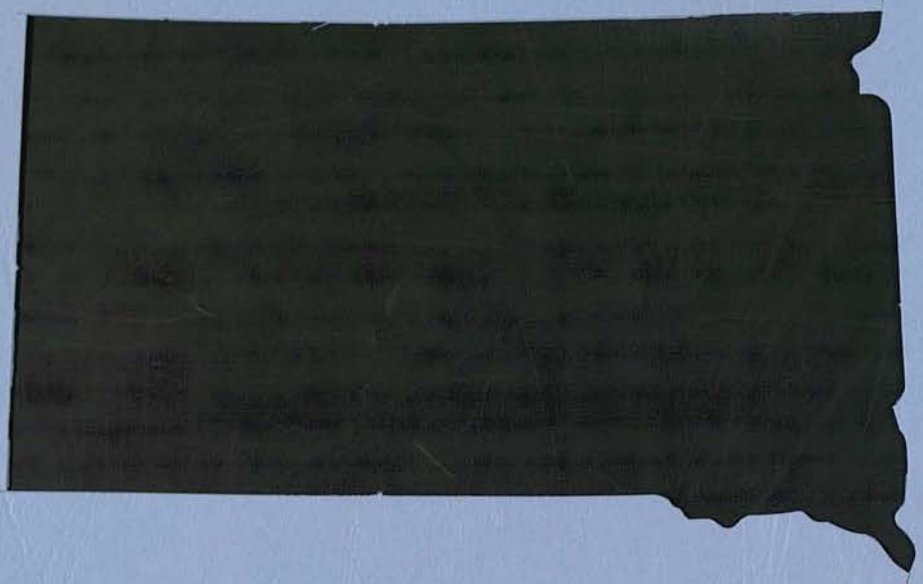
Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

378.783
E67
94-5



Waite Library
Applied Economics - U of M
1994 Buford Ave - 232 ClaOff
St Paul MN 55108-6040 USA

ECONOMICS DEPARTMENT

South Dakota State University
Brookings, South Dakota

378.783
E367
~~95~~ 94-5

LONG-TERM PRODUCTIVITY AND PROFITABILITY OF CONVENTIONAL AND ALTERNATIVE FARMING SYSTEMS IN EAST-CENTRAL SOUTH DAKOTA: A CASE STUDY

by

Thomas L. Dobbs and James D. Smolik*

Economics Research Report 94-5

November 1994

*Dobbs is a Professor of Agricultural Economics and Smolik is a Professor of Plant Science, both at South Dakota State University, Brookings, SD.

Preface

Many people contributed to the initiation and implementation of this long-term farming systems study. Encouragement to undertake such a study originally came from Allan, Charles, and William Johnson; Fr. Leonard Kayser; and Dr. Ray Moore, former Director of South Dakota State University's Agricultural Experiment Station. Funding came from Experiment Station projects in the Plant Science and Economics Departments and from the USDA's "LISA" (later "SARE") program under agreement No. 92-COOP-1-7266.

We are especially grateful for the research and technical assistance provided by several individuals. In the Economics Department, Clarence Mends made major contributions in the early years of the study, and David Becker and Lon Henning played key roles in the later years. Valuable assistance was provided in the Plant Science Department by Kristi Lewis, Kim Compton, and Tom Machacek.

The study would have been impossible without the generous time contributions of the case study farmers. Since we promised not to identify them without their permission, they remain anonymous in this report. We sincerely appreciate all the time they spent with us and other members of the research team.

Thanks go to Larry Janssen and Diane Rickerl for reviewing a draft of this manuscript. We take responsibility for any remaining shortcomings of the paper, however.

TLD and JDS
November 1994

"One-hundred fifty copies of this document were printed by the Economics Department at a cost of $1.35 per document."

Contents

	Page
Preface	i
Contents	ii
List of Tables	iii
List of Figures	iv
Agronomic Performance	3
Research methods	3
Results	4
Economic Performance	9
Research methods	9
Baseline results	10
Results with farmer-reported yields	14
Effect of organic price premiums	17
Factors Affecting Economic Performance	17
Yields	18
Crop acreage distribution	18
Federal farm program	20
Conclusions	23
References	25

List of Tables

		Page
Table 1.	Crop acreage proportions on each farm	3
Table 2.	Hand-harvested corn and soybean yield estimates in Alternative and Conventional farming systems, Lake County (1985-1992)	5
Table 3.	Fall soil test results for Alternative and Conventional farming systems, Egan soil associations (1985-1992)	6
Table 4.	Farmer-reported corn and soybean yields, Lake County cooperative studies, 1985-1992	8
Table 5.	1985-1992 averaged results from Lake County farming systems study, baseline yield estimates	10
Table 6.	Comparison of net returns with different yield estimates	15

List of Figures

		Page
Figure 1.	Direct costs other than labor	11
Figure 2.	Gross income	12
Figure 3.	Net returns to management	13
Figure 4.	Government payments	21

Long-term Productivity and Profitability of Conventional and Alternative Farming Systems in East-central South Dakota: A Case Study

by

Thomas L. Dobbs and James D. Smolik

A small body of evidence has begun to emerge over the last 3 to 4 years on the comparative productivity and profitability of conventional farming systems and alternative systems which (1) avoid or use very small amounts of synthetic chemical fertilizers and pesticides, and (2) place greater emphasis on crop rotations, especially rotations which involve forage and green manure legumes. Most of the evidence thus far has been based on only a few years of data, however. In contrast, South Dakota State University (SDSU) has recently completed three relatively long-term studies comparing conventional and alternative systems. Two of the studies were conducted at SDSU's Northeast Research Station, north of Watertown, S.D. in Codington County. Conventional, reduced tillage, and alternative farming systems were compared there, over the period 1985-92 in one study and over 1985-93 in the other study. Results of those studies appear in Dobbs (1994a), Dobbs, et al. (1994), Smolik and others (1994), Smolik, et al. (1993; and forthcoming), and Smolik and Dobbs (1991).

The third SDSU study was conducted on two operating farms in Lake County, in east-central S.D. An "Alternative" and a "Conventional" farm, in the same neighborhood and with similar soils, were compared from 1985 through 1992. Results for the first 5 years (1985-1989) of this comparison were reported in Dobbs, et al. (1991), and results for the complete 8-year (1985-1992) study

period are contained in the present report. A brief summary of the economic findings has been reported previously by Dobbs and Henning (1993).

The Alternative (Alt) farm was "organic" (i.e., free of purchased synthetic chemical input use) on most of its land during this period. It averaged approximately 750 acres of cropland, and its principal rotation covered 4 years and included (in sequence) small grain under-seeded with alfalfa-alfalfa-soybeans-corn. Recently, the farm began to move to a 5-year rotation that includes an additional soybean crop following corn.

The Conventional (Conv) farm used primarily a 2-year corn-soybean rotation and averaged approximately 830 crop acres. It is considered "conventional" in its use of purchased chemical inputs, though the operator used reduced tillage practices and drilled his soybeans during much of the study period.

A consolidated summary of the crop acreage distribution for both farms is shown in Table 1 for 1985-1992 and 1989-1992. The Conv farm averaged 84 percent of its crop acreage in corn and soybeans over the 8-year study period, compared to 50 percent for the Alt farm. Small grains and alfalfa averaged 20 percent and 18 percent, respectively, of crop acreage on the Alt farm. Small grains and alfalfa combined averaged only 5 percent of acreage on the Conv farm over the 8-year period; they did average 10 percent, however, over the most recent 4 years (1989-92).

Table 1. Crop acreage proportions on each farm.

Alternative farm	Corn & beans	Small grains	Alfalfa	Set aside*	Total %**
1985-1992 average	50%	20%	18%	12%	100%
1989-1992 average	53%	20%	16%	12%	100%
Conventional farm	**Corn & beans**	**Small grains**	**Alfalfa**	**Set aside***	**Total %****
1985-1992 average	84%	2%	3%	10%	100%
1989-1992 average	82%	4%	6%	7%	100%

*Also includes paid set-aside and 0/92 acres.

**Rounding causes some totals to differ slightly from 100%.

Both the Conv and the Alt farm are considered well managed, given the respective production strategies they have chosen. Hogs and beef cattle are part of both farms, but the livestock operations were not included in the analysis reported here.

Yield performance of these two different farming systems is compared in the following section of this report. After that, economic performance is compared in terms of several cost and return measures. Then, factors involved in the differential economic performance are discussed. In the final section, we spell out the conclusions and implications of this study.

Agronomic Performance

Research methods. Data were collected from an Alt and a Conv farm. The topography where the two farms are located in Lake County is gently rolling. The climate is continental, with a 7-

month (April-October) growing period, and the long-term average growing season precipitation is 19.7 inches.

Agronomic data were collected from areas within fields with Egan soil associations (fine-silty, mixed, mesic Udic Haplustolls; slopes 0-6 percent). Egan soils are deep and well drained and have medium to high fertility. Both farms increased in size over the course of the study, and in the later years (1989-1992), data were collected from two sets of each system. Corn and soybean yields were estimated by hand-harvesting 10 randomly selected 3-foot lengths of row. Root and soil samples were collected in late September-early October, and 6-10 samples were collected for each plot area. Weed populations in row crops were estimated in mid-season with the aid of a 1-ft-square wire frame at three random locations in each plot. Post-plant spring surface residues were estimated using the SCS line intersect method at four random locations in each plot. Data were statistically analyzed using years as replications.

Results. Over the period 1985-1992 corn yields did not differ significantly between systems; however, soybean yields were significantly (P=0.05) higher on the Conv farm (Table 2). Soybeans were planted in narrow rows in most years in the Conv system, which may account for the higher yields. Variability in corn production as measured by the coefficient of variation (CV) was less in the Alt system (14.3% vs. 18.5%). However, variability in soybean production was lower in the Conv system (11.3% vs. 20.6%).

Table 2. Hand-harvested corn and soybean yield estimates in Alternative and Conventional farming systems, Lake County (1985-1992).

Year	Yield (Bu/A)			
	Corn		Soybean	
	Alt	Conv	Alt	Conv
1985	88.1	110.6	23.1	30.5
1986	115.3	107.0	36.3	38.4
1987	136.6	134.7	25.0	39.1
1988	130.7	79.0	38.7	39.0
1989	128.7	128.5	31.4	36.1
1990	108.8	146.6	29.4	41.7
1991	121.0	126.6	28.1	42.3
1992	99.3	145.2	21.9	32.2
Average:	116.1	122.3	29.2	37.4*

*Indicates significant increase at P=0.05 level.

Fall soil test levels of NO_3-N were not high in either system and were not significantly different (Table 3). Most South Dakota soils are naturally high in potassium, and soil test levels of potassium were similar in both systems. Percent organic matter was significantly higher in the Alt system (Table 3), and soil test levels of phosphorus were significantly higher in the Conv system. Higher levels of organic matter in Alt systems also have been reported in other studies.

Table 3. Fall soil test results for Alternative and Conventional farming systems, Egan soil associations (1985-1992).

Soil Test*	Alternative	Conventional	F Test
NO_3-N (lbs/A) (0-24")	36.5	39.5	N.S.**
Phosphorus (lbs/A) (0-6")	10.0	17.6	F=22.4
Potassium (lbs/A) (0-6")	552	554	N.S.**
Organic Matter (%) (0-6")	4.3	3.7	F=8.8

*Data are averages for all crops in a system.

**N.S. = not significant.

Soil strength, bulk density, and water content were measured the Fall of 1992 (Schumacher, et al., 1993). Soil strength in the top 8 inches, as measured by a recording cone penetrometer, was significantly lower in the Alt corn and soybeans compared to the Conv system. Soil strength increased substantially below 8 inches in all systems, suggesting the presence of a plow pan. Bulk density did not differ significantly between systems. Soil moisture content was high in all systems, but it was significantly lower in the top 6 inches in the Alt corn and soybeans. The lower soil moistures in these crops may be an indication of improved internal soil drainage in the Alt system, possibly as a result of including alfalfa in the rotation.

A moldboard plow was not used in either system, and in the later years of the study corn was no-till planted in the Conv system. Post-plant spring surface residues, averaged over all crops in the systems during the period 1990-1992, were 49% in the

Alt system and 53% in the Conv system. Thus, both systems appeared to provide adequate protection of the soil surface.

The dominant weed in both systems was foxtail (Setaria spp.), and over the period 1989-1992 foxtail numbers were higher in the Alt system. Foxtail numbers in corn and soybeans averaged approximately 12 plants per 3 ft^2 in the Alt system vs. 3 plants per 3 ft^2 in the Conv system.

No corn rootworm damage was detected in the Alt corn in any year of the study, while rootworm damage in the Conv corn ranged from minor to severe. Corn borer damage also tended to be higher in the Conv system. Dagger nematode (Xiphinema americanum) numbers were moderately high in both systems, and over the 1985-1992 period averaged 271 per 500 cm^3 soil in the Alt system and 197 per 500 cm^3 in the Conv system. The absence of inversion tillage (moldboard plowing) in both systems apparently contributed to the increased dagger nematode populations. Populations of other plant parasitic nematodes as well as populations of predaceous and microbial feeding nematodes varied considerably across crops and seasons, and in general did not differ significantly between systems. Populations of Oligochaetes (pot worms) tended to be higher in the Alt system; however, populations of larger earthworms were not different between systems.

Farmer-reported corn and soybean yields are reported in Table 4. Both corn and soybean yields were significantly higher on the Conv farm. The farmer-reported yields were generally lower than the hand-harvested yield estimates obtained from areas with Egan

soils. This might have been expected because Egan soils are among the most productive in Lake County, and also because of the greater efficiency of hand-harvesting. The only instance in which farmer-reported yields were higher than the hand-harvested estimates was in the Conv corn in 1988 (Tables 2 and 4). The Conv corn plot area in 1988 was heavily infested with corn rootworm and corn borer, and it also had high populations of lesion nematodes, all of which contributed to the low yield estimate. This pest infestation apparently was not typical of the whole farm, however, which could explain the higher farmer-reported corn yields. The low corn yield estimates in the Conv system aid in explaining the nearly equal net returns recorded in 1988 (Figure 3).

Table 4. Farmer-reported corn and soybean yields, Lake County cooperator studies, 1985-1992.

	----Yield (Bu/A)-----			
	Corn		Soybean	
Year	Alt	Conv	Alt	Conv
1985	70	80	20	30
1986	65	95	22	35
1987	98	125	25	40
1988	93	95	34	40
1989	88	91	26	35
1990	94	105	27	33
1991	95	108	26	33
1992	69	98	21	32
Average:	84	100*	25	35*

*Indicates significant increase at 0.05 level of probability.

Economic Performance

Research methods. Whole-farm spread sheet analyses were conducted with the crops components of the Conv and the Alt farm for each year of the 8-year (1985-1992) study period. Actual acres planted to each crop (or "set aside" under the Federal farm program) were recorded for each year. Hand-harvested corn and soybean yields (Table 2) were used in the "baseline" analyses for each farm; yields reported by the farmers were used for other crops (small grains and alfalfa). In an alternative analysis--characterized as "analyses with farmer-reported yields"--yields reported by the farmers themselves were also used for corn and soybeans.

Crop outputs were valued using estimates of "marketing year" prices and of government support payments each year. Support payments were primarily in the form of "deficiency payments". Organic price premiums received for some of the crop output of the Alt farm were ignored in the baseline analysis, but included in a different analysis, also covered in this report.

Prices of inputs such as fuel, fertilizer, herbicides, and labor were periodically updated. All labor was assigned a cost in the budgets, regardless of whether it was hired or provided by the operator or family members. "Management" time for planning and marketing was not assigned a charge, however.

The land charge was left unchanged over time, so that the economic effects of other factors would be more clear. Charges for land consisted of $29.40/acre for the opportunity cost of money

tied up in land (based on 7 percent return on $420/acre land) and $6.30/acre for property taxes (based on 1.5 percent of the $420/acre market value).

Baseline results. Baseline results averaged over the 8-year study period are contained in Table 5. Direct (cash, or operating) costs other than labor for the Alt farm were roughly half those of the Conv farm. However, the Conv corn-soybean farm averaged $68/acre in net income over all costs except management for the 8-year period, whereas the largely organic Alt farm averaged $40/acre (ignoring organic premiums) with its small grain-alfalfa-soybeans-corn rotation.

Table 5. 1985-1992 averaged results from Lake County farming systems study, baseline yield estimates.

	Dollars/acre					
			Net income over			Whole farm, net income over all costs except management* ($)
Farm	Direct costs other than labor	Gross income	All costs except land, labor, and management	All costs except land and management	All costs except management	
Alternative	45	164	87	75	40	30,441
Conventional	88	227	111	104	68	59,013

*The Alternative farm averaged 753 acres from 1985-1992 and the Conventional farm averaged 828 acres from 1985-1992.

Note: Whole farm and per acre figures may appear to be slightly inconsistent, but this is due to rounding.

Direct costs other than labor, gross income, and net returns to management (the same thing as "net income over all costs except management") are traced over time in Figures 1, 2, and 3,

Figure 1. Direct costs other than labor

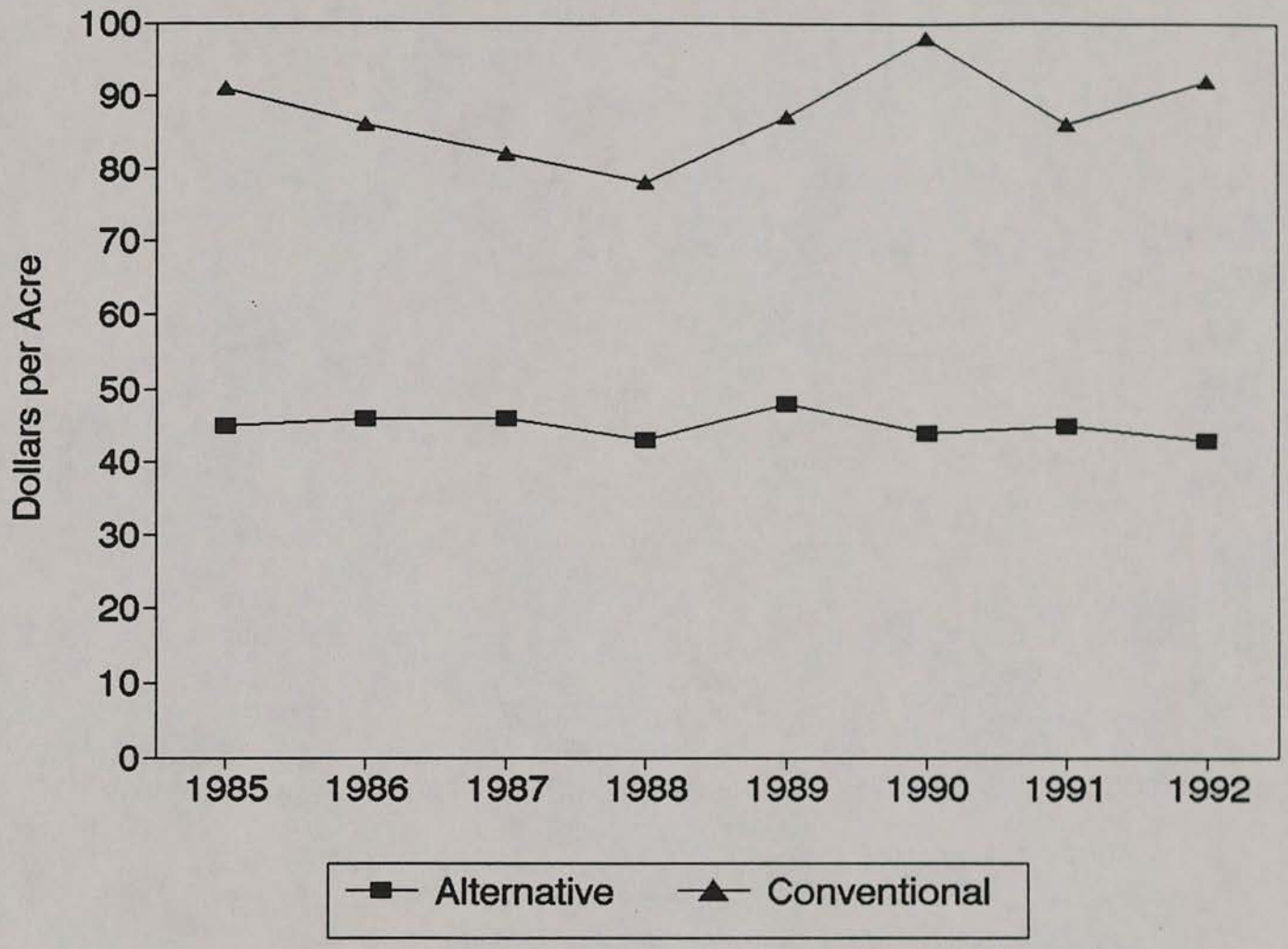


Figure 2. Gross income

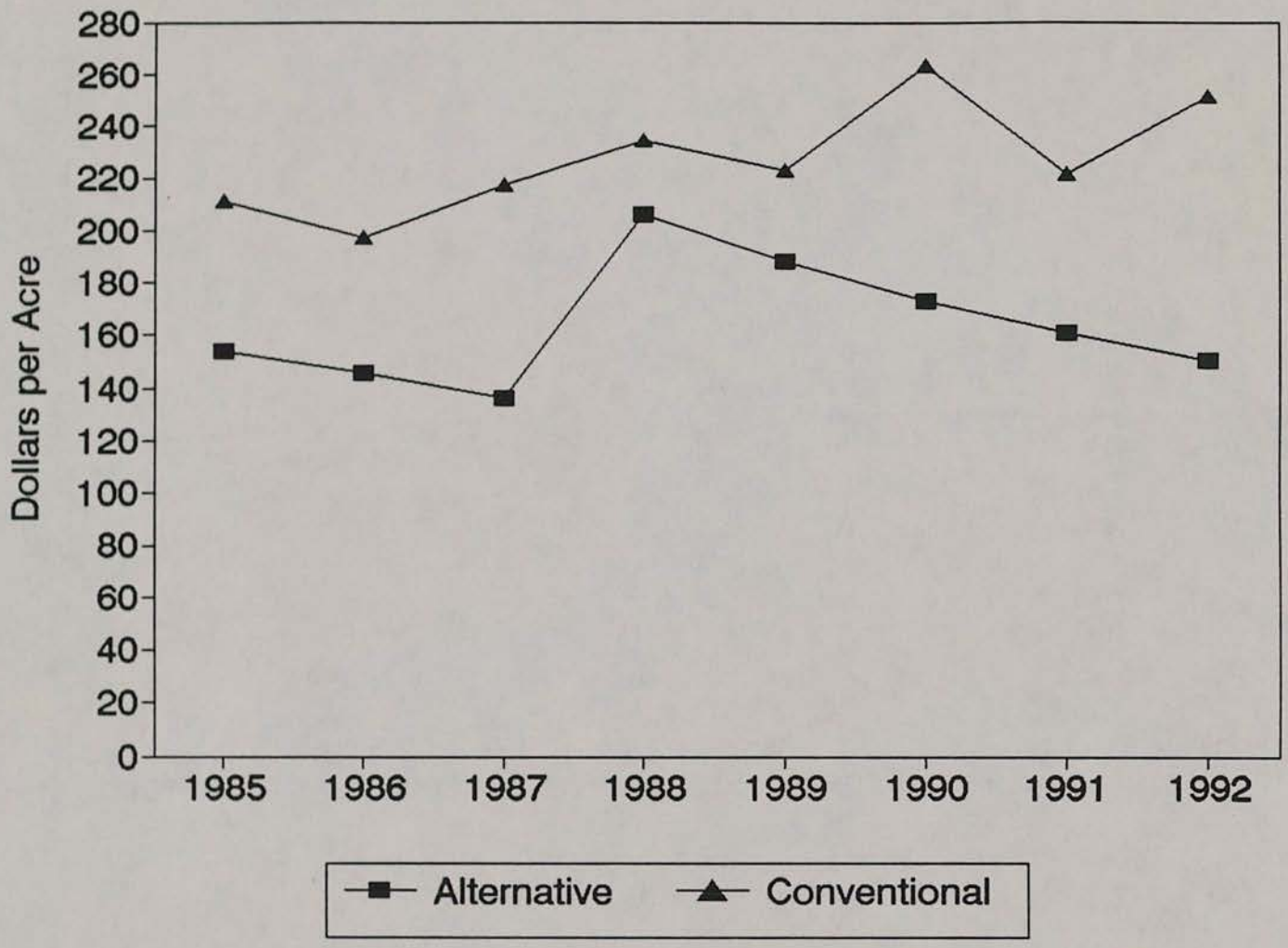
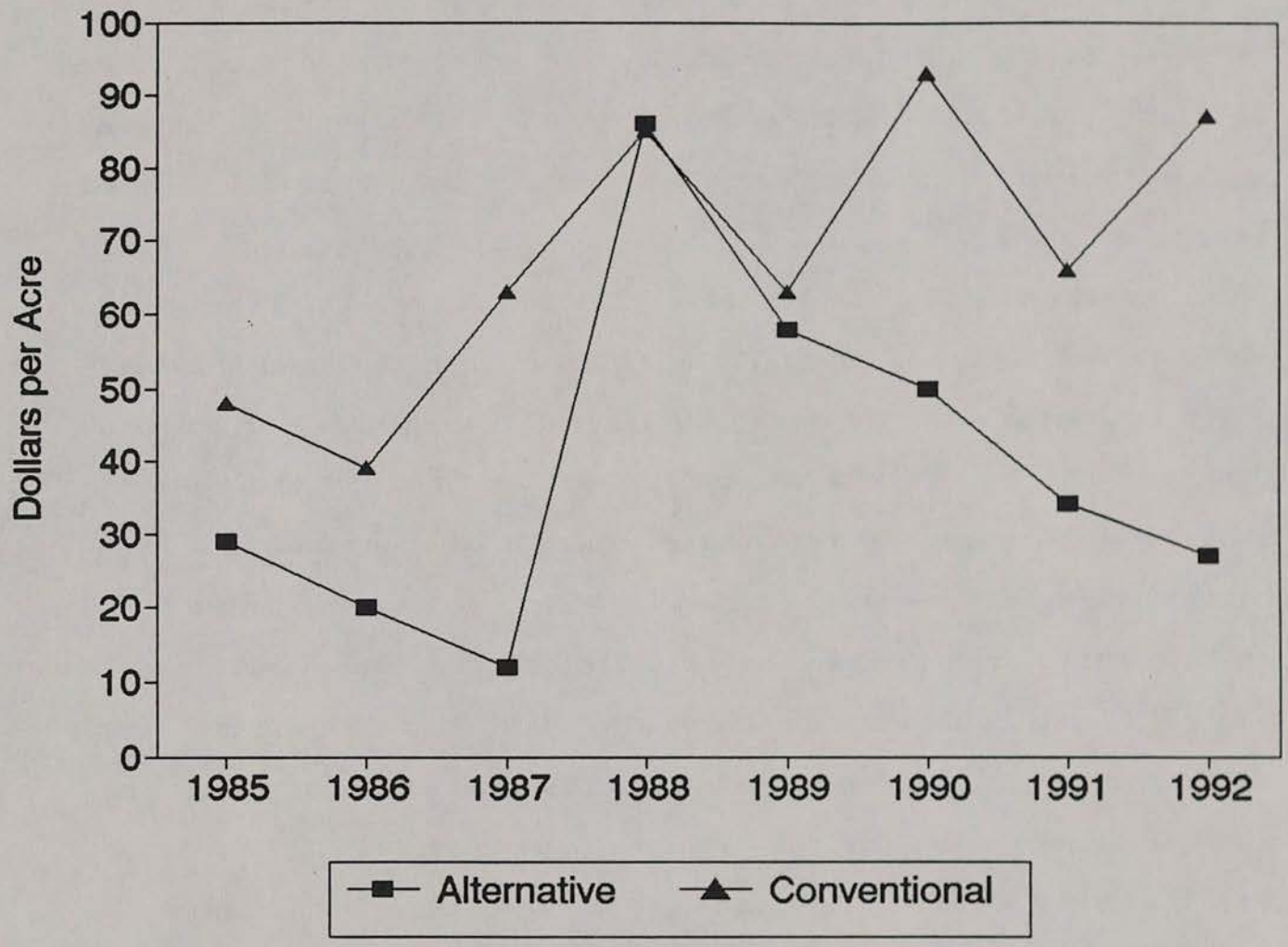


Figure 3. Net returns to management



respectively. Direct costs were consistently lower for the Alt farm because of the near absence of the use of agri-chemicals on that farm and because of the differences in crop mix between the two farms. Gross income, on the other hand, was always higher on the Conv farm when organic premiums on the Alt farm were ignored. Only in 1988 were net returns without organic premiums as high for the Alt farm as for the Conv farm. Net return variability, as measured by the standard deviation, was somewhat greater for the Alt farm (22.49) than for the Conv farm (17.92). Variability was much greater for the Alt farm when measured by the coefficient of variation (0.57 vs. 0.26).

Results with farmer-reported yields. Farmer-reported yields for corn and soybeans generally were lower than the hand-harvested yield estimates. Consequently, estimated net returns for both the Conv and the Alt farm were lower. Net returns in the baseline analysis--where corn and soybeans yields were based on the hand-harvested estimates--are compared in Table 6 with net returns based on farmer-reported corn and soybean yields. The comparison for the entire 8-year period is shown in the first two columns of data. Net returns with farmer-reported yields are $19/acre lower than with baseline yields for the Alt farm, and they are $22/acre lower for the Conv farm. Although net returns for both farms are substantially lower for both farms with farmer-reported yields, the difference between the two farms is about the same with either set of yield estimates; the difference is $28/acre with baseline yields and $25 with farmer-reported yields.

Table 6. Comparison of net returns with different yield estimates.

	Net income over all costs except management (Dollars/Acre)					
	1985-1992 (Ave)		1985-1988 (Ave)		1989-1992 (Ave)	
Farm	Baseline yields	Farmer-reported yields	Baseline yields	Farmer-reported yields	Baseline yields	Farmer-reported yields
Alternative	40	21	37	15	42	29
Conventional	68	46	59	51	77	41
Difference*	28	25	22	36	35	12

*Difference = Conventional - Alternative

Which yields estimates are used does make a great deal more difference, however, if we look at the last 4 years of the study compared to the first 4 years. The middle two columns of Table 6 show the comparisons for 1985-1988, and the last two are for 1989-1992. In the first 4 years of this study, the net return differences were much greater with farmer-reported yields, but they were much greater with the baseline (hand-harvested) yields during the last 4 years. The difference in net returns between the Conv and the Alt farm was $35/acre in 1989-1992 when baseline yield estimates were used, compared to only $12/acre when farmer-reported yields were used.

Farmer-reported yields are for the whole farm, whereas the baseline (hand-harvested) corn and soybean yields are only for the better (Egan) soils on each farm. The baseline yields represent some of the best field conditions on each farm. Thus, it is not surprising that those yields exceed the farmer-reported yields, which cover whole-farm conditions encompassing Egan and other soils and a variety of field conditions. For instance, 24 percent of the

Alt system soils are considered hydric (wetland soils), whereas in the Conv system 14.9 percent of the soils are hydric (Rickerl, 1993). In a cool, moist year such as 1992, a greater proportion of hydric soils could lead to substantially lower whole-farm yields. This may explain the appreciable drop in farmer-reported corn and soybean yields on the Alt farm compared to the previous year (Table 4). This would not explain why the difference between Conv and Alt farm net returns was <u>less</u> in the last 4 years of the study, however.

Farmer-reported yields in the first 4 years of the study were based on recall-interviews conducted in 1989. Subsequently, farmer-reported yields were collected each winter for the previous season's crops. As a consequence, farmer-reported yields for 1989-1992 are likely to be more accurate than those for 1985-1988.

It is not entirely clear why the hand-harvested vs. farmer-reported yield and associated net return differences widened over the last 4 years for the Conv farm and narrowed for the Alt farm, compared to the first 4 years (Table 6). Whatever the reason is, this pattern needs to be considered in attempts to interpret the widening net returns gap between the Conv and the Alt farm that was observed in Figure 3. Recall that Figure 3 represented net returns derived from baseline yields. Net returns for the Alt farm, using baseline (hand-harvested) corn and soybean yields on the Egan soils, deteriorated considerably relative to those for the Conv farm after 1989. The apparent profit superiority of the Conv farm over the last 4 years of the study is much less marked when <u>all</u>

field conditions on both farms are considered (last column of Table 6), however.

Effect of organic price premiums. Information on organic price premiums received by the Alt farmer was not available to us for crop years prior to 1989. From 1989 through 1992, the Alt farmer received organic premiums in some years for portions of his soybeans, oats, wheat, and corn production. We conducted analyses, using the baseline yield estimates, to determine how much difference these premiums made to net returns on the Alt farm.

Over the 4-year 1989-1992 period, organic price premiums added an average of $11/acre to net income over all costs except management on the Alt farm. This was enough to narrow but by no means close the net returns gap between the Alt and Conv farm during that period ($35/acre with baseline yields, next to last column in Table 6). The organic premiums did cause net returns of the Alt farm to exceed those of the Conv farm in 1989, but they did not do so in the 3 years after that.

We did not calculate net returns with organic premiums included for the Alt farm <u>using farmer-reported yields</u>. However, it appears that net returns for the two farms might have been very similar in that instance, since the net returns difference in 1989-1992 based on farmer-reported yields--<u>without organic premiums</u>--was only $12/acre (last column of Table 6).

Factors Affecting Economic Performance

Net income over all costs except management averaged $28 more per acre for the Conv farm than for the Alt farm (Table 5, using

baseline yield estimates.) Attempting to explain differences in economic performance between farming *systems* is always difficult because of the multiplicity of interacting factors that are involved. Without implying that these are the only ones, we focus here on three possible factors: (1) yields, (2) crop acreage distribution, and (3) the Federal farm program.

Yields. We reported earlier in this paper that hand-harvested yields over the 8-year study period differed significantly (at the P=0.05 level) for soybeans but not for corn. However, we used measured yields for each farming system in the in the enterprise budgets for <u>both</u> crops in determining profits each year. Those yields averaged 5 percent (6.2 bu) higher for corn and 28 percent (8.2 bu) higher for soybeans on the Conv farm compared to the Alt farm. The yield differences--especially for soybeans--clearly contributed to the profitability advantage of the Conv farm.

To illustrate the effect of these yield differences on profitability, assume typical early-1990s market prices of $2.00/bu for corn and $5.50 for soybeans in South Dakota. At those prices, the yield differences increased average gross returns on the Conv farm, compared to the Alt farm, by $12.40 per acre planted to corn and by $45 per acre planted to soybeans. The soybean yield difference clearly had a much greater impact on gross returns and relative profits than did the corn yield difference.

Crop acreage distribution. We noted previously, referring to Table 1, the much greater dominance of corn and soybeans in the crop acreage mix of the Conv farm in comparison to the Alt farm.

It is risky to attribute net returns to individual crop enterprises when crops are part of interrelated *crop systems*, as they are in this study, especially on the Alt farm. Nevertheless, with that caution in mind, we do need to say something about the relative profitability of different crops.

Corn and soybeans have both been very profitable crops for the Conv farm. For example, in 1991, a fairly typical year, the corn (for grain) and soybean enterprises on the Conv farm contributed net income (over all costs except management) of $89 and $87 per acre, respectively, to overall farm profitability. Those two enterprises, together, made up 75 percent of the Conv farm's crop acreage that year.

In that same year, those two enterprises constituted only 54 percent of the Alt farm's crop acreage. The Alt farm's corn enterprise provided net income of $121/acre in 1991, and the soybean enterprise provided $19/acre. Alfalfa (not counting that handled as ordinary set aside acres), constituting 21 percent of the Alt farm's crop acreage in 1991, provided $28/acre in net income. However, small grain crops, which accounted for 22 percent of the acreage on the Alt farm, were produced at an average <u>net loss</u> of $31/acre. In fairness to the small grain crops, some served as nurse crops for alfalfa and included the seed costs for alfalfa in their budgeted expenses. However, the alfalfa (other than ordinary set aside) and small grain crops--which <u>combined together</u> constituted 43 percent of the crop acreage--contributed, on average, a <u>net loss</u> of approximately $2/ac on the Alt farm in

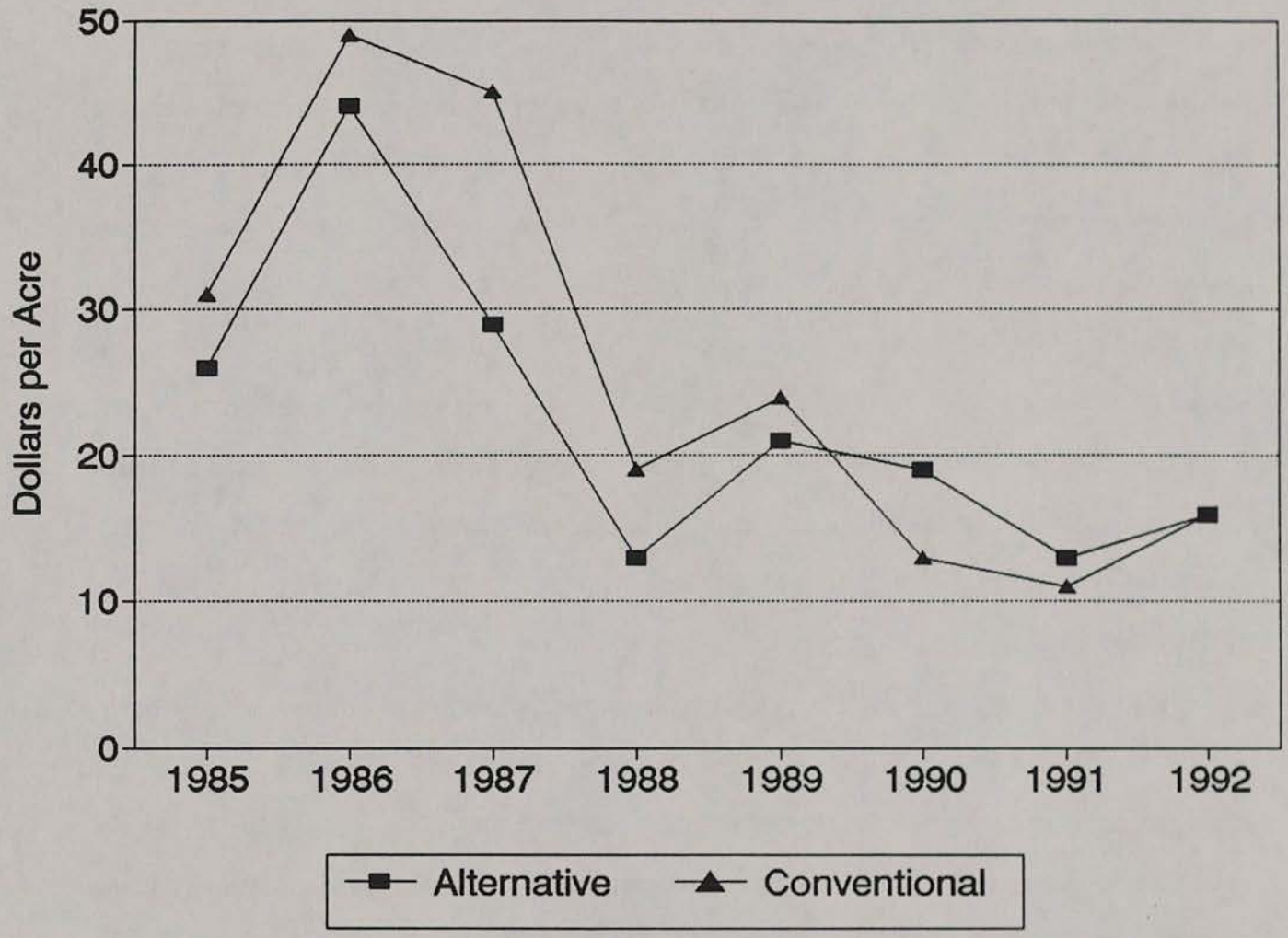
1991. This contrasts with an average net income of $68/ac on the 54 percent of that farm's acreage in corn and soybeans that year. Of course, the corn and soybeans on the Alt farm could not have been produced without purchased chemical inputs (as they were) had they not been integral parts of rotations including such crops as alfalfa and small grains.

In spite of the necessary cautions in drawing conclusions about individual enterprises, it does seem fair to say that crop acreage mix has a lot to do with the profitability differences observed in this study. Corn and soybeans are normally quite profitable crops in east-central South Dakota. Inclusion of small grains in crop rotations, thereby reducing the acreage in corn and soybeans, is one of the costs generally paid in switching to organic and low-chemical input systems in the western Corn Belt.

Federal farm program. The pattern of government farm commodity program payments to both farms over the 8-year study period is shown in Figure 4. Payments were higher for the Conv farm the first 5 years (1985-1989), but they were equal or higher for the Alt farm the last 3 years (1990-1992). Over the entire 8 years, payments to the Conv farm average a little more than $3/ac greater on the Conv farm--$26/ac on the Conv farm compared to $22.62/ac on the Alt farm. This $3/ac makes up only a small portion of the $28/ac average difference in net income for the two farms (1985-1992 results with baseline yields, Table 6).

These government "payments" included deficiency payments, amounts by which loan rates exceeded market prices during the

Figure 4. Government payments



marketing season, 0/92 program payments, and payments for paid set aside acres. Except for deficiency payments, these payments were applicable only in some years of the study. In 1991 and 1992, the Alt farmer received deficiency payments for acreage planted to certain "resource conserving crops", in addition to the normal "program crops", because he was enrolled in the then new Integrated Farm Management (IFM) program option.

If we break the study period into 1985-1988 and 1989-1992 segments, the data indicate that government payments contributed to the Conv farm's net income advantage in the first 4 years but not (on average) in the last 4 years. The Conv farm's government payments averaged $8/ac more in 1985-1988--$36/ac compared to $28/ac for the Alt farm. However, the Alt farm's payments averaged $1.25/ac more in 1989-1992--$17.25/ac compared to $16/ac for the Conv farm. Thus, **without** government farm commodity program payments, the net income advantage for the Conv farm shown in Table 6 would have narrowed (by $8/ac) in 1985-1988 and widened (by $1.25/ac) in 1989-1992.[1]

Reasons why the Alt farm's government payments were greater or equal to those of the Conv farm during the last three years of the study included: (1) the Alt farmer used the 0/92 program in 1990, but the Conv farmer did not; and (2) the Alt farmer increased the amount of deficiency payment he was able to receive in 1991 and 1992 by participating in the IFM program option.

---

[1]This statement is based on the simplifying assumption that acreage set asides and crop acreage distributions on both farms would remain the same without government payments.

Conclusions

The Conventional farm in this study was more profitable in most years and on average than was the Alternative farm during the period 1985-1992. This was due primarily to higher soybean yields and a greater proportion of acreage in corn and soybeans on the Conv farm. Somewhat higher corn yields and, in the early years of the study, higher levels of government farm program support also contributed to the Conv farm's profitability advantage.

However, the Alt farm also earned very respectable profits over the course of the study. Earnings were sufficient every year to cover all fixed and variable costs--including land charges and payments to family labor--**and** leave a residual return to "management". Although organic price premiums were not figured into the baseline comparisons, they added an average of $11/acre to net returns on the Alt farm over the last 4 years of the study (1989-1992).

This study contributes to the emerging body of evidence that indicates organic and low-chemical input systems have more difficulty competing with conventional systems in corn-soybean areas than in small grain and mixed row crop-small grain areas (Dobbs, 1994b). For alternative systems with greatly reduced chemical inputs and diverse crop mixes containing small grains and forage or green manure legumes to become more prevalent in and on the edge of the Corn Belt, the following may be necessary: (1) more research on just what kinds of alternative systems best fit different agro-climatic areas; (2) policies that discourage high-

chemical input systems in areas where those systems are imposing significant "external" costs on the environment; and (3) Federal farm policy that "levels the playing field" for other crops (including forage and green manure legumes) relative to corn. The 1990 Farm Bill began to level that playing field, and 1995 legislation may go even further.

References

Dobbs, T.L. 1994a. Organic, conventional, and reduced till farming systems: Profitability in the Northern Great Plains. **Choices** 7, No. 3: 54-55.

Dobbs, T.L. 1994b. Profitability comparisons: Are emerging results conflicting or are they beginning to form patterns? Presented at Symposium on "Sustainable Agriculture: Conceptual and Methodological Issues", Annual Meeting of the American Agricultural Economics Association, San Diego, California, August 8.

Dobbs, T.L., and L.D. Henning. 1993. Long-term economic performance of alternative, conventional, and reduced tillage farming systems in east-central and northeast South Dakota. **Economics Commentator No. 330**. Economics Department, South Dakota State University, Brookings, November 24. pp. 1-3.

Dobbs, T.L., J.L. Kelderman, and L.D. Henning. 1994. Comparative profitability of alternative, conventional, and minimum till farming systems at SDSU's Northeast Station in 1993. **1993 Annual Progress Report: Northeast Research Station, Watertown, South Dakota**. Plant Science Pamphlet 73, South Dakota State University, Brookings, January. pp. 40-42.

Dobbs, T.L., J.D. Smolik, and C. Mends. 1991. 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, pp. 250-65.

Rickerl, D.H. 1993. Impacts of agricultural management systems on economic, environmental, and wildlife values of altered and unaltered wetland areas, in **1993 North Central Region ACE Program Progress Report**, Bleakley, et al., p. 30.

Schumacher, T.E., J.A. Schumacker, T.A. Machacek, and J.D. Smolik. 1993. Soil strength, bulk density, and water content in Alternative Farming Systems Cooperative Studies, 1992, Madison, S.D. Plant Science Mimeo Report. South Dakota State University, Brookings.

Smolik, J.D. (Project Leader), and others. 1994. Farming systems studies, 1993. **1993 Annual Progress Report: Northeast Research Station, Watertown, South Dakota**. Plant Science Pamphlet 73, South Dakota State University, Brookings, January. pp. 35-39 and 42-47.

Smolik, J.D., and T.L. Dobbs. 1991. Crop yields and economic returns accompanying the transition to alternative farming systems. **Journal of Production Agriculture** 4, No. 2: 153-61.

Smolik, J.D., T.L. Dobbs, D.H. Rickerl, L.J. Wrage, G.W. Buchenau, and T. A. Machacek. 1993. **Agronomic, Economic, and Ecological Relationships in Alternative (Organic), Conventional, and Reduced-Till Farming Systems.** Agricultural Experiment Station Bulletin 718, South Dakota State University, Brookings, August.

Smolik, J.D., T.L. Dobbs, and D.H. Rickerl. Forthcoming. The relative sustainability of alternative, conventional, and reduced-till farming systems. **American Journal of Alternative Agriculture.**