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Transition to Organic Production:
Analysis and Planning Tools Based on
Minnesota Farm Record Data

by

Timothy A. Delbridge, Robert P. King, Dale W. Nordquist,
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Department of
**APPLIED
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College of Food, Agricultural
and Natural Resource Sciences

UNIVERSITY OF MINNESOTA

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Farm Performance during the Transition to Organic Production: Analysis and Planning Tools Based on Minnesota Farm Record Data

Timothy A. Delbridge,^a Robert P. King,^b Dale W. Nordquist,^c
Gigi DiGiacomo,^b and Meg Moynihan^d

^a Agribusiness Department, Cal Poly San Luis Obispo

^b Department of Applied Economics, University of Minnesota

^c Center for Farm Financial Management, University of Minnesota

^d Minnesota Department of Agriculture

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As farmers consider transition to organic production, many express concerns about the cost of transition and about the lack of information regarding costs and returns during and after transition. These concerns can be significant impediments to the expansion of organic production at a time when demand for organic food products is growing rapidly. There are few published studies on the economics of organic transition, and little actual farm data on costs and returns during and after transition is available.

The Tools for Transition (TFT) project was an integrated five-year research and extension project funded under the Organic Research and Extension Initiative of USDA's National Institute for Food and Agriculture. The project was designed to generate new insights about the economics of organic transition; create unique data resources for farmers, other agricultural professionals and lenders; and inform policymakers of the potential economic barriers to organic certification. The project had two inter-related long-term goals for addressing the need for farm-based information about farm financial performance during the transition from conventional to organic production:

1. Collect data on farm performance measures during the transition to organic production and develop resources such as an online database and analysis tools to generate benchmark reports for crop and livestock enterprises and whole farm performance during transition.

2. Develop web-based and print materials to address the informational needs of farmers transitioning to organic production and the educational needs of agricultural professionals who advise them.

This publication summarizes enterprise costs and returns and whole-farm financial performance measures collected from transitioning and recently certified organic farms in Minnesota that were enrolled in the Farm Business Management (FBM) program offered through the Minnesota State Colleges and Universities (MnSCU) system. It includes data for crop and dairy enterprises on participating farms under conventional, transitional, and certified organic management. It also includes whole farm financial performance data for participating farms prior to the start of transition, during transition, and after certification. We believe this is the first detailed compilation of farm record data for farms transitioning to organic production in the United States.

In the sections that follow we first briefly summarize characteristics of the farms that participated in the TFT project. Next we describe the data collected from TFT farms and the methods used to summarize the data. The summarization poses some significant challenges due to confidentiality concerns and because the data were collected from farms operating under soil and climate conditions that vary considerably across the state. We then present summary data for crop and dairy enterprises and for whole farm performance of dairy and crop farms. We conclude with an example that illustrates how the data resources provided here can be used to develop financial projections for a farmer considering the transition to organic production.

The Tools for Transition Farms

Over the course of the TFT project, team members recruited 46 transitioning and recently certified farmers to enroll in the state's Farm Business Management (FBM) program. Collectively, at the start of project participation, these 46 farms managed a total of 18,151 acres, for an average farm size of 395 acres. The land included:

- 4,535 acres in transition
- 1,761 recently certified acres
- 8,193 acres that had been certified for three years or more
- 3,662 acres managed conventionally.

The 24 TFT farms with dairy enterprises managed a total of 2,350 dairy cows with an average herd size of 98 cows. Total dairy cow numbers included:

- 692 cows in transition
- 583 cows recently certified
- 945 cows that had been certified organic three years or more
- 130 cows under conventional management.

A total of 22 farm business management instructors worked with at least one TFT farm. Project team members made adjustments to the FINPACK and FINBIN computer systems and the procedures used by instructors in order to facilitate capture of enterprise-level data on transitioning and recently certified farms.

An intake survey of TFT farmers identified common motivations for transitioning to organic production. Those most frequently mentioned included: environmental/conservation reasons, price premiums, health/safety reasons, personal satisfaction, and philosophical/ethical reasons. We also surveyed participating farmers annually to identify important challenges during transition. These included: access to capital, access to land, time requirements, cost and availability of inputs, and weed management.¹

Data

Each of the participating TFT farms contributed annual production and financial records through the FBM education programs administered by the MnSCU system. With this rich data set we are able to conduct an analysis at both the enterprise and whole-farm level. Since some of the TFT farms had previously enrolled in the FBM program independently, the full data set includes some production and financial data collected before the TFT project began enrolling farmers in 2011. As a result, the farms that had previously enrolled in the FBM program are represented by many years of data while farms that did not participate in FBM prior to joining the TFT project may be represented by as few as a single year of data. Some TFT farms contributed data from conventional crop and/or livestock operations in addition to data from transitional and certified organic production, while others had no conventional production to report. Of the farms that were enrolled in the TFT project, 42 farms contributed usable data, collectively representing 248 years of crop management history and 145 years of dairy management history.

Methods

Ideally, a quantitative analysis of farm-level performance before, during, and after the organic transition would be carried out using data from a large number of farms from areas with similar soil and climate conditions over many years. However, data of this nature do not exist. While the data collected by the TFT project are the best available on transitional farm performance, they are still limited for the purpose of statistical analysis. Much of the difficulty in analyzing these data comes from the fact that the TFT farms are located in different regions of the state with different soil types and in different climates. Further complicating data analysis are the varying effects that weather and pest pressure have on both agricultural yields and operating expense outlays from year to year. These issues make it difficult to say whether fluctuations in crop yields or net returns for a particular farm are due to the farm's organic transition status or to environmental conditions specific to the farm's region in that year.

Furthermore, privacy guidelines prohibit the reporting of any averages for crop or livestock enterprise results (such as yields, expenses, and net returns) unless they are based on data from five or more farms. The privacy guidelines for reporting whole-farm financial results (such as net farm income, rate of return, and debt-to-asset ratio) are even stricter. Average results for whole farm measures cannot be reported unless they are based on data from ten or more farms. In some years and locations there are indeed fewer than five organic/transitional farms in the TFT data set, making it impossible to report traditional averages of farm-level performance at the county or regional level.

¹ Complete survey results, quarterly project newsletters, and a series of farmer profiles are posted on the project's eOrganic web site, eorganic.info/toolsfortransition.

Ratio Analysis

In consideration of privacy guidelines and geography-related limitations, and to include as much of the data gathered from participating TFT farms as possible in our analysis, we developed a method of ratio analysis for comparing each farm's yields, expenses, and overall financial performance to the average performance of conventional operations in that farm's region for a given year.² For example, in 2014 there 211 farms that produced conventional corn in southwest Minnesota on owned land and contributed their production data to the FINBIN database. The average yield on these farms was 170 bushels per acre. Suppose a participating TFT farm in southwest Minnesota grew organic corn in 2014 on owned land and achieved a yield of 120 bushels per acre. This farm's corn yield ratio would be calculated as:

$$Ratio_{org,SW,2014} = \frac{120}{170} = 0.706$$

The TFT farm achieved an organic corn yield that is 70.6% of the average conventional corn yield for that year and region. By normalizing the farm-level performance by the relevant regional average in this way we are accounting for the effect of weather and geography on farm performance while protecting confidentiality. When applied to whole-farm financial performance, the ratios also control for fluctuations in crop and milk prices that affect the profitability of all farms in a particular year. The ratios can then be pooled across years and regions without resulting in biased averages or medians. We construct similar ratios using conventional, transitional, and organic production and financial data from farms participating in the TFT project and we use these results to identify changes in farm performance during and after transition to organic management.

Note that the performance ratios compare all conventional, transitional and organic observations for TFT farms to average conventional production outcomes rather than to average organic production outcomes, which are also available through the FINBIN database. We construct the ratios in this way for two reasons. First, most farmers who are considering adopting organic production methods currently manage their farms conventionally. Decision tools or data products that result from this analysis will be most valuable if they help farmers forecast farm outcomes during transition and after organic certification using the more familiar conventional production averages as a baseline. Second, while the FINBIN database contains valuable information on organic production in Minnesota, there are not enough organic producers in every region and every year in the database to make constructing regional organic averages feasible.

The ratio analysis "normalizes" transitional and organic farm outcomes by relating farm-level performance measures to conventional regional averages. It is worth mentioning that the performance of transitional and organic farms relative to neighboring conventional farms might change from the results observed during the TFT study period and reported here. Indeed, much of the data used in this analysis was collected in years of historically high conventional grain prices. When conventional grain prices enter a period in which they are lower relative to organic grain prices than they were during the study period (as seems to be the case at the time of writing), organic crop production will become more profitable relative to conventional production than this report would suggest, and organic dairy farming could be less profitable. It is important that the reader keep in mind what these data and ratio results are telling us and to make sure to use the information appropriately.

² The regional averages that are used in this comparison also come from data gathered by MnSCU's FBM program and are publically available through the University of Minnesota's FINBIN database.

Challenges

The use of farm to region performance ratios in the analysis presents several challenges. First, since we are dealing with a relatively small group of farms, averages or means can be quite strongly influenced by outliers. For example, if we have data on only 10 farms that grew soybeans during the organic transition, and one of these farms experienced a crop failure and a very low yield, the average performance for the transitional soybean enterprise might seem lower than it would if we were reporting an average from a larger group of farms. Our solution to this problem is to report the median rather than the mean of the performance ratios described in the previous paragraph. Since medians are the “middle point” of the group, one very high or very low yield or expense outcome will not affect the median as strongly as it would affect the mean. The downside to this is that some medians, particularly those for individual production expense categories, can actually be zero if more than half of the farms in the group did not incur that particular expense.

A second issue arises with the analysis of whole-farm financial results from participating crop farms before, during, and after their organic transition. By analyzing the whole-farm financial results we can provide some insights into what happens to the “bottom line” of these farms as they pursue organic certification. The results regarding total revenues, expenses and net farm income during transition and after organic certification are often the most interesting and intriguing results. However, the challenge is in defining what we mean by a “transitional” or an “organic” farm. Most farms that transition from conventional to organic crop production do so gradually, with small portions of the farm entering transition and receiving certification while other parcels are managed conventionally. This is a valuable risk and cash-flow management technique but it forces us, if we want to compare these whole-farm financial results across organic transition status, to settle on a guideline of how much land a farm must have in organic transition before we consider it a farm *in transition*. For this analysis, we consider a crop farm with more than 20% of its crop land in transition as a *transitional* farm. If a farm has achieved organic certification on more than 50% of the farm’s cropland we consider it an *organic* farm. If neither of these conditions hold, we consider the farm conventional.

Finally, there is a mathematical problem that can arise when we construct ratios from performance measures that can have negative values. In particular, the ratios of two negative numbers and two positive numbers are both positive, which makes a meaningful interpretation of the ratio median impossible. We provide a full description of this problem and the steps that we take to address it in the appendix to this report but we mention the issue here to explain why net return variables are excluded from the crop and dairy enterprise reports. If interested in the net returns to a particular enterprise, the reader should consider the enterprise’s gross return ratio and total expense ratio and draw conclusions from these regarding the predicted net returns.

Data Summary - Field Crops

Median enterprise cost and return ratios are presented in tables 1-5 for corn, soybeans, oats, alfalfa establishment, and alfalfa hay³. Each table has a column for conventional, transitional, and organic enterprise-years. These are based on data from the TFT project, so these ratios are reflective of costs and returns for farms that, at some time, have chosen to start the transition to organic production. All ratios are relative to the corresponding conventional enterprise averages for each farm’s region. (See *Methods* for more information.)

³ These tables are also available in Microsoft Excel at eorganic.info/toolsfortransition/reports.

Tables 1-5 can be used along with conventional FINBIN enterprise data for a county or region to build transitional and organic enterprise budgets for a specific farm. Consider, for example, the seed cost ratio of 0.80 for transitional corn in table 1. If the average seed cost has been \$110 per acre over the past several years in a county, an expected seed cost for transitional corn would be $\$110 \times 0.80 = \88.00 . It is reasonable that the seed cost would be lower for a transition enterprise, since the non-GMO seeds planted on transitional land may be less expensive.

Similar calculations can be done for each of the other items in the budget. It is important to keep in mind that cost and return estimates calculated in this manner are just a starting point when developing budgets. In the case of seed, for example, using a quote from a seed dealer will likely be more accurate. Nevertheless, budgets built with the ratios provide a good initial estimate when estimating “reasonable” enterprise cost and return values for transitional and organic management based on the experience of other farmers.

It may seem odd that the ratios in the column for conventional management are not all equal to 1.00. The ratios differ from 1.00 because they compare cost and return data for TFT farms to average cost and return figures for all conventional farms in the corresponding region and year. Presenting farm performance results in this way helps put the data for the TFT farms in context. For example, the fact that most of the ratios for conventional corn in table 1 are slightly below 1.00 suggests that conventional corn enterprises for TFT farms had costs and returns that were slightly below the average of all conventional farms.

For farms that have their own data for a conventional enterprise, it also may seem natural to use farm level cost and return figures in place of county or region averages when applying the ratios presented here. It is important to keep in mind that these ratios reflect the performance of TFT farms relative to regional averages, and that there is some risk in trying to extrapolate to situations that are not represented in the data. Our recommendation would be to compare projected enterprise returns and costs based on a county or regional average multiplied by the conventional management ratios to your own conventional enterprise data in order to better understand how conventional enterprises for the TFT farms differ from your own.⁴ Then use insights from that comparison to adjust projected returns and costs for transitional and organic management based on the ratios and county or regional average data to reflect expectations for your farm. For example, if your conventional yields are higher than projected conventional yields, it seems reasonable to make some upward adjustment in yields projected for transitional and organic management when planning your own transition.

Corn

Table 1 presents enterprise ratios for corn. Looking first at enterprise size in acres, the median TFT corn enterprise is considerably smaller than the average corn enterprise in its region. This is due, in part, to smaller farm sizes, but it may also reflect greater enterprise diversification on the TFT farms. Looking next at revenues, prior to transition, the TFT farms had yields and total product return only slightly below the average for other conventional farms in their region. The yield and total product return ratios of 0.78 and 0.84 for transitional management suggest that farms do experience some yield reductions as they switch to organic production practices. The yield ratio drops still further after certification – to 0.69

⁴ See table 10, which is introduced and explained later in this report, for an example of projected returns and costs based on regional average enterprise data.

– but this is more than offset by the dramatic increase in the value per unit, which is 2.32 times that for the average conventional farm. As a result, total product return per acre for organic corn fields is 1.40 times that for the average conventional enterprise. Finally, for this and other crop enterprises, the gross return per acre ratio includes hedging gains and losses, crop insurance indemnities, and other crop income.

Table 1. Cost and Return Ratios for Corn Enterprises

Category	Conventional	Transitional	Organic
Number of Enterprise-Year Observations	127	17	113
Number of Farms Contributing Data	16	11	27
Acres	0.59	0.21	0.52
Yield (bushel)	0.95	0.78	0.69
Value per bushel	0.98	1.01	2.32
Total product return per acre	0.90	0.84	1.40
Gross return per acre	0.91	0.85	1.47
Direct Expenses			
Seed	0.84	0.58	0.67
Fertilizer	0.74	0.00	0.35
Crop chemicals	1.13	0.00	0.00
Crop insurance	0.90	0.32	0.79
Fuel & oil	1.14	0.82	1.03
Repairs	0.86	0.73	0.97
Custom hire	0.93	0.00	0.00
Operating interest	0.72	0.00	0.19
Land rent (for leased acreage)	0.82	0.76	0.72
Total direct expenses per acre (owned)	0.96	0.68	0.70
Total direct expenses per acre (leased)	0.93	0.56	0.75
Overhead Expenses			
Hired labor	0.75	0.61	0.64
Farm insurance	0.93	0.80	0.92
RE & pers. Property taxes (for owned acreage)	0.91	0.69	0.73
Dues & professional fees	0.71	0.17	0.66
Interest (for owned acreage)	0.98	1.21	0.76
Interest (for leased acreage)	0.98	0.19	0.67
Mach & bldg depreciation	0.81	0.70	0.65
Total overhead expenses per acre (owned)	0.87	1.06	0.88
Total overhead expenses per acre (leased)	0.96	0.94	1.05
Total direct & overhead expenses per acre (owned)	0.94	0.96	0.82
Total direct & overhead expenses per acre (leased)	0.93	0.63	0.82
Government payments	0.78	0.54	0.75
Labor & management charge	0.91	0.62	0.60

Turning attention to direct expenses, the total direct expense per acre ratio for both owned and leased land is below 1.00 for all three production systems (conventional, transitional and organic) and is lowest under transition management. Closer inspection of ratios for individual direct cost categories provides insights about the conventional corn enterprise for farms that have transitioned. Seed and fertilizer cost ratios well below 1.00 suggest that, prior to transitioning, TFT farms may have used less intensive production practices than other conventional farms in their region. Similarly, the land rent ratio of 0.82 suggests that these farms may be renting less productive land.

It is noteworthy that, with one exception, the fertilizer and crop chemicals cost ratios are zero for the transitional and organic enterprises, due to the necessary shift away from commercial fertilizers and chemical inputs. The exception is the fertilizer ratio of 0.35 for organic enterprises, which reflects expenditure on manure or commercial organic fertilizer. Finally, all three production systems have operating interest expense ratios that are lower than 1.00, suggesting that these farm operations rely less on short-term credit than nearby conventional operations. This ratio is lower for transitioning and organic enterprises than for conventional TFT farm observations, indicating that the transition to organic management is often accompanied by further reductions in the use of short-term credit.

The total overhead expense per acre ratio does not show a consistent trend across the management system categories. Similarly, patterns for individual overhead cost categories are difficult to interpret. The relatively low cost ratios for interest under organic management for both owned and leased acreage are noteworthy, however. They indicate that the TFT farms rely less on intermediate and long term debt once they have achieved certification.

Total direct & overhead expenses per acre ratios for corn are close to 1.00 across all three management systems for owned land but are lowest under organic management. We see a similar pattern on leased land, with the exception of the low total expense ratio for transitional enterprises. Net return per acre ratios are not reported in table 8, due to problems with interpreting ratios when negative net returns are possible. However, the high gross return per acre ratio for the organic management system paired with the total direct & overhead expense ratios slightly below 1.00 indicates that organic corn enterprises tend to be more profitable per acre than conventional corn in the same region.

Soybeans

Table 2 presents enterprise ratios for soybeans. Once again, the median enterprise size for TFT farms is well below the regional average enterprise size due to smaller farm size and greater enterprise diversification. On average, TFT farmers had conventional yields and total product return per acre essentially equal to those of other conventional soybean producers in their area. Yield ratios drop sharply under transitional and organic management. The total product return per acre ratio falls to 0.60 for transitional enterprises but then rises to 1.20 for organic fields because of the higher value per unit. The slightly higher value per unit under transitional management may be due to a price premium for non-GMO soybeans. The ratio of 2.02 for organic management reflects the significant price premium for organic soybeans.

The median of total direct expenses for conventional soybean enterprises managed by TFT farmers is slightly above the regional average for conventional soybean enterprises on owned land and at the regional average for leased land. Total direct expenses on owned land under transitional and organic management are, respectively, 36 percent above and 15 percent below regional conventional averages; they are equal to regional averages on leased land for transitional enterprises and nine percent below

regional averages for organic enterprises. Looking more closely at individual cost categories, organic seed costs are well below regional averages, most likely due to lower prices for non-GMO seeds.

Table 2. Cost and Return Ratios for Soybean Enterprises

Category	Conventional	Transitional	Organic
Number of Enterprise-Year Observations	107	9	30
Number of Farms Contributing Data	16	5	10
Acres	0.62	0.82	0.30
Yield (bushel)	1.02	0.69	0.56
Value per bushel	0.99	1.06	2.02
Total product return per acre	0.99	0.60	1.20
Gross return per acre	0.98	0.90	1.37
Direct Expenses			
Seed	0.94	0.96	0.50
Fertilizer	0.00	0.00	0.00
Crop chemicals	1.12	0.00	0.00
Crop insurance	0.82	0.86	0.85
Fuel & oil	1.10	1.01	1.02
Repairs	0.92	0.92	0.88
Custom hire	0.00	0.12	0.00
Operating interest	0.94	0.82	0.08
Land rent (for leased acreage)	0.83	1.00	0.41
Total direct expenses per acre (owned)	1.08	1.36	0.85
Total direct expenses per acre (leased)	1.00	1.00	0.91
Overhead Expenses			
Hired labor	0.83	0.14	0.04
Farm insurance	1.00	0.62	0.56
RE & pers. Property taxes (for owned acreage)	0.87	0.49	0.67
Dues & professional fees	0.76	0.00	0.57
Interest (for owned acreage)	0.83	1.04	0.91
Interest (for leased acreage)	0.99	0.19	0.19
Mach & bldg depreciation	0.76	0.87	0.52
Total overhead expenses per acre (owned)	0.90	1.23	1.00
Total overhead expenses per acre (leased)	0.96	1.29	1.07
Total direct & overhead expenses per acre (owned)	1.03	1.36	0.90
Total direct & overhead expenses per acre (leased)	1.01	0.90	0.93
Government payments	0.87	0.81	0.86
Labor & management charge	0.80	0.63	0.64

The total overhead expenses per acre ratio is slightly below 1.00 for conventional enterprises managed by TFT farmers, well above 1.00 for transitional enterprises and at or slightly above 1.00 for organic enterprises for both owned and rented land. It is difficult to see a clear pattern in ratios for the individual overhead cost categories.

The total direct & overhead expenses per acre ratio for conventional soybean fields managed by TFT farmers is slightly above the regional average for conventional soybean fields on both owned and rented land. This total expense ratio rises to 1.36 under transitional management on owned land, but otherwise is slightly below the regional average for the transitional and organic enterprises. As with corn, the gross return per acre ratio is well above 1.00 for organic enterprises and the total direct & overhead expense ratios slightly below 1.00. These figures suggest that organic soybeans tend to have a higher net return per acre than the regional average for conventional soybeans. On the other hand, soybeans under transitional management are likely to have lower net return per acre than the regional average. Low returns during transition are a financial barrier to reaching very attractive net returns after certification.

Oats

Table 3 presents enterprise ratios for oats. Oats are normally grown in combination with establishment alfalfa, but the two are treated as independent enterprises in this publication. Oat enterprises under conventional and transitional management on TFT farms are smaller than the regional average, but they are larger than the regional average under organic management. TFT farmers had total product return per acre ratios above 1.00 for conventional oats grown prior to the start of transition and for organic oats. The total product return per acre ratio for organic oats is 1.24, with the value per unit ratio (representing prices received) of 1.78 offsetting the very low yield ratio of 0.58. The TFT farms' total product return per acre ratio for transitional fields was only 0.62 due to yield and product value per unit ratios that were both less than 1.00.

The total direct expenses per acre ratio is above 1.00 for all oat enterprises except transitional oats on leased land. The seed cost ratio is consistently above 1.00 across all three production systems. As expected, fertilizer and crop chemical ratios are zero for both transitional and organic enterprises, and operating interest ratios are consistently low.

As with corn and soybeans, there is no clear trend across production systems for the total overhead expenses per acre ratio. The same is true for the total direct & overhead expenses per acre ratios, but it is noteworthy that these are generally greater than 1.00, indicating that TFT farms had higher than average costs.

With a gross return per acre ratio slightly below 1.00 and a total direct & overhead expense ratio well above 1.00 for both owned and leased land, the average net return for conventional oats on TFT farms is below the regional average. Similarly, with a very low gross return per acre ratio and total expense ratios close to or above 1.00, the average net return for transitional oats on TFT farms is almost certainly below the regional average. With both gross return and total direct & overhead cost ratios above 1.00 for organic oat enterprises on TFT farms, it is difficult to say how organic net returns compare with regional averages.

Table 3. Cost and Return Ratios for Oat Enterprises

Category	Conventional	Transitional	Organic
Number of Enterprise-Year Observations	26	10	36
Number of Farms Contributing Data	7	5	14
Acres	0.67	0.43	1.22
Yield (bushel)	1.08	0.62	0.58
Value per bushel	0.97	0.83	1.78
Total product return per acre	1.07	0.62	1.24
Gross return per acre	0.99	0.53	1.14
Direct Expenses			
Seed	1.42	1.51	1.33
Fertilizer	0.92	0.00	0.00
Crop chemicals	0.66	0.00	0.00
Crop insurance	0.54	0.00	0.00
Fuel & oil	0.95	0.61	0.92
Repairs	0.90	0.77	0.85
Custom hire	0.00	0.00	0.00
Operating interest	0.00	0.00	0.17
Land rent (for leased acreage)	1.00	0.87	1.18
Total direct expenses per acre (owned)	1.15	1.07	1.39
Total direct expenses per acre (leased)	1.27	0.96	1.05
Overhead Expenses			
Hired labor	0.28	0.00	1.96
Farm insurance	0.94	0.18	1.22
RE & pers. Property taxes (for owned acreage)	1.24	0.47	1.60
Dues & professional fees	1.12	0.54	0.99
Interest (for owned acreage)	1.98	1.86	2.48
Interest (for leased acreage)	0.82	0.70	0.91
Mach & bldg depreciation	1.12	0.60	0.63
Total overhead expenses per acre (owned)	1.63	1.26	1.50
Total overhead expenses per acre (leased)	0.94	1.24	1.28
Total direct & overhead expenses per acre (owned)	1.29	1.14	1.27
Total direct & overhead expenses per acre (leased)	1.20	0.96	1.06
Government payments	0.65	0.56	0.99
Labor & management charge	1.02	1.13	0.63

Alfalfa Establishment

Table 4 presents enterprise ratios for alfalfa establishment, an enterprise normally combined with oats or some other small grain but treated as an independent enterprise in this analysis. On average, TFT farmers have smaller alfalfa establishment enterprises under conventional and transitional management systems than do other conventional farms in their region. Organic alfalfa establishment enterprises managed by TFT farmers are, on average, very close in size to the regional average. This is likely due to the fact that alfalfa is one of the most important soil building crops used in organic rotations. Yields are normally very low for alfalfa in the establishment year, and they are lower than regional conventional averages for TFT farms under all three management systems. Similarly, total product return per acre and gross return per acre ratios are well below 1.00 for all three management systems.

The total direct expenses per acre ratio is below 1.00 for all three management systems on both owned and leased, indicating that TFT farmers generally had lower expenses than conventional producers in their region. Direct expense ratios for transitional management are especially low. The pattern is less consistent for overhead expenses. Total overhead expense ratios for conventional and organic fields are very close to 1.00, but the ratios for transitional enterprises are well below 1.00 for both owned and leased land. It is not surprising, then, that total direct & overhead expenses per acre ratios are, with the exception of organic enterprises on owned land, below 1.00 for all three systems and especially low for transitional fields.

With gross return ratios consistently well below 1.00 and total direct & overhead expense ratios that are generally below 1.00, it is difficult to infer how returns to establishment alfalfa enterprises on TFT farms compare with regional averages. It is important to note, however, that net returns on this enterprise are consistently very low or negative.

Alfalfa Hay

Table 5 presents enterprise ratios for alfalfa hay. On average, TFT farmers have conventional and transitional alfalfa hay enterprises that are slightly smaller than the regional average and organic enterprises that are significantly larger. Yields are very close to the regional average for conventional and transitional enterprises managed by TFT farmers, but the yield ratio is well below 1.00 for organic enterprises. The effect of lower yields for organic enterprises is largely offset by higher than average value per unit, however. Total product return per acre and gross return per acre ratios are only slightly below 1.00 for organic fields and are slightly above 1.00 for conventional and transitional fields.

The total direct expenses per acre ratio for both owned and leased land is slightly above 1.00 for conventional fields managed by TFT farmers but is well below 1.00 for transitional and organic fields. Fertilizer expense ratios are zero for transitional and organic fields, and fuel & oil and repair expense ratios are quite low for these two management systems. The high custom hire expense ratio for organic fields is also noteworthy and may need to be adjusted when using these ratios to develop planning budgets for a farm that has its own forage harvesting equipment.

There is no clear pattern in total overhead expenses per acre ratios, but ratios are relatively low for transitional enterprises on both owned and rented land. Regardless of land tenure, total direct & overhead expenses ratios are above 1.00 for conventional enterprises, slightly below 1.00 for organic enterprises, and well below 1.00 for transitional enterprises. Considering this, along with the gross return per acre ratios close to 1.00 for all three management systems, we can infer that transitional alfalfa enterprises managed by TFT farmers are, on average, more profitable than the regional average,

while conventional and organic enterprises managed by the TFT farms have net returns fairly close to the regional average.

Table 4. Cost and Return Ratios for Alfalfa Establishment Enterprises

Category	Conventional	Transitional	Organic
Number of Enterprise-Year Observations	27	10	26
Number of Farms Contributing Data	11	6	10
Acres	0.75	0.86	1.01
Yield (ton)	0.72	0.80	0.40
Value per ton	0.84	0.75	1.16
Total product return per acre	0.45	0.45	0.44
Gross return per acre	0.43	0.45	0.44
Direct Expenses			
Seed	0.78	0.63	0.90
Fertilizer	0.00	0.00	0.00
Crop chemicals	0.00	0.00	0.00
Crop insurance	0.00	0.25	0.00
Fuel & oil	0.76	0.45	0.62
Repairs	0.84	0.11	0.86
Custom hire	0.00	0.14	0.00
Operating interest	0.90	0.69	0.00
Land rent (for leased acreage)	0.90	0.82	0.80
Total direct expenses per acre (owned)	0.83	0.65	0.92
Total direct expenses per acre (leased)	0.87	0.50	0.77
Overhead Expenses			
Hired labor	0.79	0.01	0.37
Farm insurance	0.88	0.74	0.79
RE & pers. Property taxes (for owned acreage)	1.09	0.69	0.60
Dues & professional fees	1.17	0.09	0.48
Interest (for owned acreage)	1.51	1.27	0.56
Interest (for leased acreage)	1.75	0.22	0.30
Mach & bldg depreciation	0.83	0.28	0.72
Total overhead expenses per acre (owned)	1.09	0.68	0.94
Total overhead expenses per acre (leased)	0.93	0.26	1.06
Total direct & overhead expenses per acre (owned)	0.91	0.66	1.05
Total direct & overhead expenses per acre (leased)	0.87	0.47	0.80
Government payments	0.82	0.81	0.59
Labor & management charge	1.05	0.72	0.54

Table 5. Cost and Return Ratios for Alfalfa Hay Enterprises

Category	Conventional	Transitional	Organic
Number of Enterprise-Year Observations	112	27	71
Number of Farms Contributing Data	13	11	21
Acres	0.92	0.96	1.23
Yield (ton)	1.00	0.96	0.81
Value per ton	1.04	1.09	1.24
Total product return per acre	1.00	1.05	0.93
Gross return per acre	1.01	1.03	0.97
Direct Expenses			
Seed	0.00	0.00	0.00
Fertilizer	0.79	0.00	0.00
Crop chemicals	0.00	0.00	0.00
Crop insurance	0.00	0.00	0.00
Fuel & oil	1.01	0.48	0.57
Repairs	0.81	0.51	0.61
Custom hire	0.00	0.00	1.34
Operating interest	0.40	0.45	0.00
Land rent (for leased acreage)	1.02	0.68	0.80
Total direct expenses per acre (owned)	1.08	0.54	0.83
Total direct expenses per acre (leased)	1.03	0.63	0.77
Overhead Expenses			
Hired labor	0.54	0.14	0.99
Farm insurance	0.91	1.07	0.69
RE & pers. Property taxes (for owned acreage)	1.22	0.97	0.91
Dues & professional fees	1.00	0.34	0.68
Interest (for owned acreage)	1.50	0.74	0.71
Interest (for leased acreage)	1.15	0.90	0.65
Mach & bldg depreciation	0.85	0.61	0.68
Total overhead expenses per acre (owned)	1.18	0.64	0.81
Total overhead expenses per acre (leased)	0.93	0.88	1.10
Total direct & overhead expenses per acre (owned)	1.15	0.57	0.93
Total direct & overhead expenses per acre (leased)	1.01	0.66	0.87
Government payments	0.77	0.47	0.55
Labor & management charge	1.02	0.83	0.67

Data Summary - Dairy

Median cost and return ratios for dairy enterprises managed by TFT farmers are presented in table 6⁵. These ratios are reported on a per-cow basis. As with crop enterprises, this table has columns for conventional, transitional, and organic farm-years. These ratios reflect costs and returns for TFT farms, and all are relative to conventional dairy enterprise averages for each farm's region. (See *Methods* for more information.)

The milk produced per cow ratio is less than 1.00 for all three management systems. This indicates that, even prior to initiating transition to organic milk production, TFT farms were using less intensive production practices. Most relied heavily on grazing as a source of feed. Grass-based dairy systems have lower production but also lower costs. The milk price per cwt ratio is 1.13 for transitional dairy enterprises and 1.42 for organic enterprises. Many transitioning dairy farmers receive a “transition premium” from their milk buyer, which boosts their milk pay price above that received by conventional producers, and certified organic milk commands a significant premium. Higher milk prices partly offset lower production, at least for organic dairy enterprises, so that the value of milk sold per cow ratio is only slightly below 1.00 for the organic management system. The gross margin per cow ratio reflects adjustments to revenue associated with the purchase and sale of cull cows and calves as well as other non-cash transfers to other enterprises – e.g., the transfer of bull calves to a beef finishing enterprise.

The total direct expenses per cow ratio is consistently well below 1.00 for all three management systems. Changes in expense ratios for feed items reflect the shift to a forage based diet that is a hallmark of organic dairy production, with the hay, alfalfa ratio rising from 1.07 for conventional management to 2.06 for transitional and 2.02 for organic. The expense ratio for corn rises for the organic system because the cost of organic corn is high relative to conventional corn. However, higher ratios for these individual feed components do not necessarily imply that overall feed costs are higher. It is also noteworthy that veterinary expense ratios are low across all three management systems for these farms. Finally, it is striking that the median hired labor expense ratio is zero for TFT farms across all three management systems. In contrast, hired labor is a significant expense item for the average conventional dairy farm.

The total overhead expenses per cow ratio is well below 1.00 for all three management systems. Expense ratios for individual overhead cost categories also are consistently below 1.00 for all three management systems. Given the ratios for total direct & overhead expenses, it is not surprising that total direct & overhead expenses per cow are also consistently well below 1.00 across the management systems.

With gross margin per cow and total direct & indirect expense ratios both below 1.00 for each management system, it is difficult to infer how net return per cow on the TFT farms compares with regional averages. However, we can say that the organic system appears to be most likely to have a net return per cow that exceeds the regional average.

⁵ These tables are also available in Microsoft Excel at eorganic.info/toolsfortransition/reports.

Table 6. Cost and Return Ratios for Combined Dairy and Replacement Heifer Enterprises

Category	Conventional	Transitional	Organic
Number of Farm-Year Observations	75	17	53
Number of Farms Contributing Data	15	10	14
Milk produced per cow (cwt)	0.78	0.62	0.58
Milk price per cwt	0.97	1.13	1.42
Value of milk sold per cow	0.78	0.72	0.85
Gross margin per cow	0.80	0.79	0.86
Direct Expenses			
Protein Vit Minerals	0.68	0.36	0.38
Complete Ration	0.14	0.90	0.00
Corn	1.06	0.94	1.29
Corn Silage	0.94	0.73	0.65
Hay, Alfalfa	1.07	2.06	2.02
Haylage, Alfalfa	0.22	0.00	0.00
Other feed stuffs	0.95	1.13	1.58
Veterinary	0.58	0.37	0.43
Supplies	0.45	0.47	0.28
Bedding	0.49	0.14	0.20
Marketing	0.66	0.49	1.42
Hired Labor	0.00	0.00	0.00
Fuel & oil	0.66	0.94	0.82
Repairs	0.72	0.89	1.00
Total direct expenses per cow	0.83	0.78	0.77
Overhead Expenses			
Farm Insurance	0.42	0.94	0.94
Utilities	0.79	0.55	0.77
Interest	0.83	0.97	0.57
Mach & bldg depreciation	0.32	0.37	0.54
Miscellaneous	0.12	0.16	0.35
Total overhead expenses per cow	0.64	0.71	0.93
Total direct & overhead expenses per cow	0.76	0.79	0.80
Labor & management charge	0.81	1.25	1.51

Table 7 reports ratios for some additional dairy performance measures. When their dairy enterprises were under conventional management, TFT farms had a cost of production per cwt that was essentially equal to the regional average for conventional farms. However, ratios for cost of production per cwt of milk under transitional and organic management range from 1.28 to 1.33. This implies that organic milk is considerably more expensive to produce. Also noteworthy in this table is the fact that, on average, the TFT farms have fewer cows and that, while feed cost per cow is consistently lower than for other conventional dairy enterprises, feed cost per cwt of milk is consistently higher.

Table 7. Additional Dairy Performance Measure Ratios*

Performance Measure	Conventional	Transitional	Organic
Number of Farm-Year Observations	75	17	53
Number of Farms Contributing Data	15	10	14
Cost of Prod Per Cwt. of Milk			
Total direct expenses	1.03	1.27	1.29
Total direct & overhead expenses	1.04	1.28	1.33
Other Information			
Number of cows	0.77	0.43	0.54
Culling percentage	0.87	1.01	0.90
Turnover rate	0.79	0.89	0.78
Feed cost per day	0.87	0.75	0.87
Feed cost per cwt of milk	1.15	1.36	1.41
Feed cost per cow	0.87	0.75	0.87

* Entries in the table are ratios of the median value for TFT farms to the regional average value.

Data Summary - Whole Farm Financial Performance

Table 8 presents median ratios of TFT whole farm financial outcomes to regional averages for dairy and crop farms.⁶ The whole farm financial performance measures are divided into four categories. The *Income Statement* measures are all reported in dollars and so they are sensitive to farm size as well as financial performance. They include indicators of cash flow as well as net farm income, which make adjustments for inventory changes and depreciation. The *Profitability* measures are all rates or ratios that are directly comparable across farms of different sizes. They indicate the efficiency of the farm business in using its resources and its ability to generate income that can be used for family living expenses, for new investments, or to build wealth. The *Liquidity and Repayment* measures, with the exception of current assets and liabilities and working capital, also are rates or ratios that are comparable across farms of different sizes. They indicate the ability of the farm to meet financial obligations as they come due. Finally, the *Solvency* measures are indicators of the ability of the business to pay all debts if sold tomorrow. Total farm assets and liabilities are measured in dollars and so are sensitive to farm size. The farm debt to asset ratio is comparable across farms of difference sizes.

For each farm type – crop or dairy – we present ratios that compare TFT farms to the average of all farms in their region for years when they were under conventional management prior to the start of transition, during transition, and after organic certification. It is important to keep in mind that in many cases the values in table 8 are *ratios of ratios*. For example, the rate of return on assets is the ratio of the return on farm assets (defined as net farm income + farm interest – the value of operator labor and management) to the average value of farm assets. If the regional average for the rate of return on assets is 10 percent and the ratio in table 8 for transitional crop farms is 0.22, then the estimated rate of return

⁶ See the University of Minnesota’s Center for farm Financial Management “Farm Finance Scorecard” publication at <http://www.cffm.umn.edu/Publications/pubs/FarmMgtTopics/FarmFinanceScorecard.pdf> for definitions of the financial performance measures in this table.

Table 8. Whole-farm Financial Summaries for Crop and Dairy Farms - Median Ratios of Farm Outcomes to Regional Averages

	Crop			Dairy		
	Conventional	Transition	Organic	Conventional	Transition	Organic
Number of farm-year observations	127	34	90	75	17	53
Income Statement						
Gross cash farm income	0.61	0.31	0.64	0.56	0.32	0.50
Total cash farm expense	0.60	0.31	0.67	0.60	0.36	0.49
Net cash farm income	0.53	0.17	0.43	0.53	0.27	0.53
Inventory change	0.51	0.26	1.19	0.60	0.41	0.62
Depreciation	0.39	0.26	0.42	0.51	0.44	0.37
Net farm income	0.47	0.14	0.56	0.59	0.21	0.56
Profitability (cost)						
Rate of return on assets	0.84	0.22	0.75	0.75	0.44	0.96
Rate of return on equity	0.98	0.09	0.80	0.82	0.30	0.64
Operating profit margin	1.09	0.36	0.85	0.88	0.30	1.00
Asset turnover rate	0.73	0.63	0.95	0.94	0.86	0.91
Liquidity and Repayment (end of year)						
Current assets (market)	0.33	0.13	0.27	0.46	0.40	0.58
Current liabilities	0.36	0.22	0.26	0.86	0.35	0.53
Current ratio	0.87	0.65	0.71	0.63	0.76	0.66
Working capital	0.18	0.08	0.23	0.14	0.24	0.27
Working capital to gross inc	0.00	0.27	0.49	0.00	0.77	0.95
Term debt coverage ratio	0.70	0.41	0.57	0.72	0.42	0.58
Replacement coverage ratio	0.73	0.53	0.85	0.65	0.74	0.89
Solvency (end of year at market)						
Total farm assets	0.54	0.39	0.45	0.96	0.59	0.69
Total farm liabilities	0.60	0.48	0.46	1.02	0.60	0.47
Farm debt to asset ratio	1.19	1.23	1.02	1.30	1.04	0.80

on assets for a transitional crop farm would be $10\% \times 0.22 = 2.2\%$. On the other hand, if the regional average net farm income for crop farms is \$50,000 and the ratio in table 8 for transitional crop farms is 0.14, the estimated net farm income for a transitional crop farm would be $\$50,000 \times 0.14 = \$7,000$.⁷

Crop Farms

All but one of the income statement ratios for TFT crop farms are less than 1.00 across the three management systems. Since these measures are sensitive to size, this indicates that the median TFT crop farm is smaller than the average crop farm in its region. The fact that they decline under transitional management may be due to a reduction in farm size that can be necessary because of increased time required for mechanical field operations or to a decline in productivity. These ratios rebound to stronger levels after organic certification and are generally higher than the pre-transition conventional ratios. However, key income statement ratios are still well below 1.00 for TFT farms under organic management.

The pattern is similar for the profitability measures, which are more directly comparable across farm sizes. Ratios for all four measures fall sharply during transition and then rise to levels closer to 1.00 under organic management. In general, the median TFT farm is more profitable under conventional management than after organic certification.⁸

Most liquidity and repayment capacity ratios decline during transition for TFT crop farms and then return to levels after certification that are comparable to but slightly below those for the farms when they were under conventional management. Results for the replacement coverage ratio are favorable, however.

Finally, ratios for both total farm assets and liabilities decline during transition and after certification for TFT crop farms, most likely due to some reduction in farm size. The ratio for the farm debt to asset ratio rises slightly during transition but then falls close to 1.00 after certification, which implies that these farms are very close to the regional average.

Dairy Farms

The income statement ratios for TFT dairy farms are all below 1.00. Since these measures are sensitive to farm size, this indicates that the TFT dairy farms are smaller than the regional average dairy farm. The ratios for all of these income statement measures fall during transition. Both cash income and cash expense decline. Most important, net cash farm income and net farm income are well below the levels for TFT farms under conventional management prior to transition. After certification, however, the ratios for these two important income measures rise to levels close to or equal to those for conventional TFT farms. We see a similar pattern for the profitability measure ratios. They fall significantly during the transition year but then, with the exception of rate of return on equity, return to levels close to or above those for TFT farms prior to transition.

The liquidity ratios for TFT dairy farms are all below 1.00, indicating that these farms have less debt repayment capacity than other dairy farms in their region. Several changes over the transition period

⁷ As noted earlier in the Methods section, it is important to use caution when using ratios for measures that can be negative, as is the case with the return on assets.

⁸ This could be due to the fact that much of the post-certification data for TFT farms is from years when conventional farming was very profitable.

are worth noting. First, the ratio for the current ratio rises during transition suggesting that farmers reduce short term liabilities to ensure that they are able to pay their bills during this difficult period. The working capital ratio also increases slightly. Also of note, the ratio for the replacement coverage ratio shows a healthy increase from conventional to organic management.

Finally, the ratios for solvency measures all tend to decline for TFT dairy farms as they move from conventional management through transition to organic certification. Assets decline but so do liabilities. The decline in the ratio for the farm debt to asset ratio is a favorable result, since a low debt to asset ratio is preferred.

Example - Using the Enterprise Ratios to Project Net Returns through Transition to Organic Production

An example helps to illustrate how the enterprise ratios presented here can be used to project farm financial performance through the transition to organic production. Our example focuses on a 480-acre conventional corn-soybean farm in southeast Minnesota. Half the acreage is owned, half is rented, and the owner is considering transitioning the owned land to certified organic production. The farm is located near a number of organic dairy farms and there is a strong market for organic hay. In addition, alfalfa hay helps build the soil during transition and suppresses weeds. Therefore, the owner would like to include alfalfa in the organic rotation. The 240 acres of rented land will continue to be managed conventionally, with half of that land planted in corn and half in soybeans.⁹

There are many paths to certification, but the split transition plan considered here is summarized in table 9 and shown schematically in figure 1. Year 1 is the last year of fully conventional production. Non-GMO corn and soybeans are planted on the acreage to be transitioned, and no prohibited substances – e.g., chemical fertilizer or herbicide – are applied after mid-July. This will make it possible to certify the land in Year 4 prior to the harvest of oats, soybeans, and corn. In Year 2, 120 acres of the transitioning land is planted in transitional corn and 120 acres is planted in transitional oats underseeded with alfalfa. In Year 3 the 120 acres previously planted in transitional corn is planted in transitional oats underseeded with alfalfa, and the established alfalfa stand is retained on the other 120 acres. This is a cropping year focused entirely on soil building and weed suppression, which are both critical for a successful transition to organic production. In Year 4, 60 acres of the land established in alfalfa in Year 2 is planted to corn, and the rest of the land remains in alfalfa. The land will certify in late July or early August, so the 60 acres of corn will be harvested as a certified organic crop. The first cuttings of alfalfa in Year 4 will be prior to certification, so this is treated as a transitional crop for planning purposes. In Year 5 the 60 acres previously planted in organic corn is planted in organic soybeans; the remaining 60 acres of alfalfa established in Year 2 is planted in organic corn; and 120 acres remains in what is now organic alfalfa. In Year 6 the long-term rotation is finally established. Organic corn is planted on 60 acres taken out of established alfalfa; organic soybeans are planted on 60 acres previously planted in organic corn; organic oats underseeded with alfalfa are planted on 60 acres previously in organic soybeans; and the remaining 60 acres is retained in organic alfalfa.

⁹ A series of Microsoft Excel worksheets used to develop this example is available online at eorganic.info/toolsfortransition/reports.

Table 9. Sample Farm Crop Acreages through Transition

Enterprise	Acreage					
	Year 1 Conventional	Year 2 Transition 1	Year 3 Transition 2	Year 4 Certification	Year 5 Organic	Year 6 Organic
Conventional Crops						
Corn	240	120	120	120	120	120
Soybeans	240	120	120	120	120	120
Transitional Crops						
Corn		120				
Soybeans						
Oats (planted with Alfalfa)		120	120			
Alfalfa Establishment		120	120			
Alfalfa			120	180		
Organic Crops						
Corn				60	60	60
Soybeans					60	60
Oats (planted with Alfalfa)						60
Alfalfa Establishment						60
Alfalfa					120	60
Total Acreage	480	480	480	480	480	480

Owned Land – To Be Certified	Rented Land – Remains Conventional
<p style="text-align: center;">Field 1 – 60 Acres</p> <p>Year 1 – Conventional Corn Year 2 – Transition Oats/Alfalfa Est. Year 3 – Transition Alfalfa Year 4 – Organic Corn Year 5 – Organic Soybeans Year 6 – Organic Oats/Alfalfa Est.</p>	<p style="text-align: center;">Field 5 – 60 Acres</p> <p>Year 1 – Conventional Corn Year 2 – Conventional Soybeans Year 3 – Conventional Corn Year 4 – Conventional Soybeans Year 5 – Conventional Corn Year 6 – Conventional Soybeans</p>
<p style="text-align: center;">Field 2 – 60 Acres</p> <p>Year 1 – Conventional Corn Year 2 – Transition Oats/Alfalfa Est. Year 3 – Transition Alfalfa Year 4 – Transition Alfalfa Year 5 – Organic Corn Year 6 – Organic Soybeans</p>	<p style="text-align: center;">Field 6 – 60 Acres</p> <p>Year 1 – Conventional Corn Year 2 – Conventional Soybeans Year 3 – Conventional Corn Year 4 – Conventional Soybeans Year 5 – Conventional Corn Year 6 – Conventional Soybeans</p>
<p style="text-align: center;">Field 3 – 60 Acres</p> <p>Year 1 – Conventional Soybeans Year 2 – Transition Corn Year 3 – Transition Oats/Alfalfa Est. Year 4 – Transition Alfalfa Year 5 – Organic Alfalfa Year 6 – Organic Corn</p>	<p style="text-align: center;">Field 7 – 60 Acres</p> <p>Year 1 – Conventional Soybeans Year 2 – Conventional Corn Year 3 – Conventional Soybeans Year 4 – Conventional Corn Year 5 – Conventional Soybeans Year 6 – Conventional Corn</p>
<p style="text-align: center;">Field 4 – 60 Acres</p> <p>Year 1 – Conventional Soybeans Year 2 – Transition Corn Year 3 – Transition Oats/Alfalfa Est. Year 4 – Transition Alfalfa Year 5 – Organic Alfalfa Year 6 – Organic Alfalfa</p>	<p style="text-align: center;">Field 8 – 60 Acres</p> <p>Year 1 – Conventional Soybeans Year 2 – Conventional Corn Year 3 – Conventional Soybeans Year 4 – Conventional Corn Year 5 – Conventional Soybeans Year 6 – Conventional Corn</p>

Figure 1. Field-by Field Crop Rotation for Sample Farm

The next step in our analysis is to use the enterprise cost and return ratios to estimate costs and returns for conventional, transitional, and organic crop enterprises. This is done for the corn enterprises in table 10. Comparable tables for all the other crop enterprises are presented in the Appendix to this report. The first three columns after the category labels in table 10 are the enterprise ratios for conventional, transitional, and organic corn enterprises for TFT farms that were presented in table 1. The column labeled "Region" has average cost and return data for all conventionally managed corn enterprises in our sample farm's region. The last three columns in the table are predicted cost and return values for conventional, transitional, and organic enterprises on our sample farm. Each of these values is simply the result of multiplying the corresponding enterprise ratio by the regional value. For example, the predicted value of the gross return per acre under organic management is $1.47 \times \$974 = \$1,428$.

The values in table 10 are predictions based on the experiences of TFT farms. In a real planning situation more accurate information may be available for some cost categories. For example, land rents can change significantly over time, and many farmers have long term agreements in place at the time they are projecting costs and returns. In our example conventional corn is being grown on rented land. The projected land rent for this enterprise is \$174. If the actual land rent were \$200, total direct expenses per acre would increase by $\$200 - \$174 = \$26$, and the projected net return per acre on leased land would fall by \$26 from \$135 to \$109. We encourage users to make such adjustments whenever they have access to planning values that they believe are more accurate than our projections.

Table 11 presents net return per acre predictions for each relevant enterprise. These net return values are taken directly from table 10 and the other enterprise tables in Appendix B of this report. For conventional corn, for example, the Year 1 value is the simple average of the net return on owned land, \$232, and the net return on leased land, \$135, since we assume that half the corn in the base year is planted on owned land and half is on rented land. In subsequent years all conventional corn is on rented acreage and so the net return per acres is \$183. All transitional and organic enterprises are on owned land. Finally, note that net return per acre is negative for transitional and organic oats and alfalfa establishment. This will adversely affect farm profitability, but it is an important investment in the soil building that is key in organic management systems.

The final step in this analysis is to determine enterprise and whole farm net returns by multiplying the acreage levels in table 9 by the net return per acre levels in table 11 and summing across all enterprises for each year to determine a predicted whole farm net return. Table 12 presents these values for the sample farm. Whole farm net return falls sharply during the two transition years, largely due to losses incurred for establishing alfalfa stands. Whole farm net return rises sharply in Years 4 and 5. In part, this is due to organic price premiums, but it can also be attributed to the fact that established alfalfa hay fields are being harvested in these years, and there is no alfalfa establishment taking place. Whole farm net return in these years is approximately double what it is in the base year, and transition losses are quickly offset. Whole farm net return declines in Year 6 when the regular organic rotation is fully in place because one-fourth of the certified organic land is now devoted to oats underseeded with alfalfa. Despite the decline from Years 4 and 5, the whole farm net return is projected to be 45 percent higher than in the baseline Year 1.

This example is presented as an illustration, but it also demonstrates the value and importance of making financial projections. In this case the transition years create considerable financial stress. A farmer undertaking the proposed transition to organic production would need a strong balance sheet to weather the difficult years and would want to work closely with a lender to be ensure access to operating credit. The financial projections would greatly facilitate discussions with a lender.

Table 10. Predicted Corn Enterprise Costs and Returns for Sample Farm

Category	Enterprise Ratios			Region	Predicted Values		
	Conv.	Trans.	Org.		Conv.	Trans.	Org.
Yield (bushel)	0.95	0.78	0.69	183	173	142	125
Value per unit (bushel)	0.98	1.01	2.32	\$5	\$5	\$5	\$12
Total product return per acre	0.90	0.84	1.40	\$920	\$832	\$774	\$1,288
Gross return per acre	0.91	0.85	1.47	\$974	\$888	\$827	\$1,428
Direct Expenses							
Seed	0.84	0.58	0.67	\$111	\$93	\$64	\$74
Fertilizer	0.74	0.00	0.35	\$170	\$127	\$0	\$59
Crop chemicals	1.13	0.00	0.00	\$35	\$40	\$0	\$0
Crop insurance	0.90	0.32	0.79	\$22	\$20	\$7	\$18
Fuel & oil	1.14	0.82	1.03	\$35	\$39	\$28	\$36
Repairs	0.86	0.73	0.97	\$48	\$41	\$35	\$46
Custom hire	0.93	0.00	0.00	\$18	\$17	\$0	\$0
Operating interest	0.72	0.00	0.19	\$10	\$7	\$0	\$2
Land rent (for leased acreage)	0.82	0.76	0.72	\$212	\$174	\$162	\$152
Total direct expenses per acre (owned)	0.96	0.68	0.70	\$495	\$476	\$335	\$346
Total direct expenses per acre (leased)	0.93	0.56	0.75	\$694	\$646	\$392	\$520
Return over direct expenses per acre (owned)				\$479	\$412	\$492	\$1,082
Return over direct expenses per acre (leased)				\$279	\$243	\$436	\$908
Overhead Expenses							
Hired labor	0.75	0.61	0.64	\$15	\$11	\$9	\$10
Farm insurance	0.93	0.80	0.92	\$9	\$8	\$7	\$8
RE & pers. Property taxes (for owned acreage)	0.91	0.69	0.73	\$10	\$9	\$7	\$7
Dues & professional fees	0.71	0.17	0.66	\$4	\$3	\$1	\$3
Interest (for owned acreage)	0.98	1.21	0.76	\$65	\$64	\$79	\$50
Interest (for leased acreage)	0.98	0.19	0.67	\$8	\$8	\$2	\$6
Mach & bldg depreciation	0.81	0.70	0.65	\$60	\$49	\$42	\$39
Total overhead expenses per acre (owned)	0.87	1.06	0.88	\$208	\$180	\$220	\$183
Total overhead expenses per acre (leased)	0.96	0.94	1.05	\$113	\$108	\$106	\$118
Net return per acre (owned)				\$271	\$232	\$272	\$899
Net return per acre (leased)				\$167	\$135	\$330	\$789

Table 11. Predicted Net Return per Acre Values for Sample Farm through Transition

Enterprise	Net Return per Acre					
	Year 1 Conventional	Year 2 Transition 1	Year 3 Transition 2	Year 4 Certification	Year 5 Organic	Year 6 Organic
Conventional Crops						
Corn	\$183	\$135	\$135	\$135	\$135	\$135
Soybeans	\$151	\$87	\$87	\$87	\$87	\$87
Transitional Crops						
Corn		\$272				
Soybeans						
Oats (planted with Alfalfa)		-\$125	-\$125			
Alfalfa Establishment		-\$157	-\$157			
Alfalfa			\$510	\$510		
Organic Crops						
Corn				\$899	\$899	\$899
Soybeans					\$482	\$482
Oats (planted with Alfalfa)						-\$8
Alfalfa Establishment						-\$309
Alfalfa					\$350	\$350

Table 12. Predicted Enterprise and Whole Farm Net Returns for Sample Farm through Transition

Enterprise	Net Return per Acre					
	Year 1 Conventional	Year 2 Transition 1	Year 3 Transition 2	Year 4 Certification	Year 5 Organic	Year 6 Organic
Conventional Crops						
Corn	\$43,985	\$16,198	\$16,198	\$16,198	\$16,198	\$16,198
Soybeans	\$36,167	\$10,467	\$10,467	\$10,467	\$10,467	\$10,467
Transitional Crops						
Corn		\$32,618				
Soybeans			\$0			
Oats (planted with Alfalfa)		-\$14,940	-\$14,940			
Alfalfa Establishment		-\$18,823	-\$18,823			
Alfalfa			\$61,185	\$91,778		
Organic Crops						
Corn				\$53,944	\$53,944	\$53,944
Soybeans					\$28,893	\$28,893
Oats (planted with Alfalfa)						-\$503
Alfalfa Establishment						-\$18,567
Alfalfa					\$41,964	\$20,982
Whole Farm Net Return	\$80,152	\$25,518	\$54,086	\$172,386	\$151,466	\$111,414

This example also shows that planning can lead to ideas about new strategies. In this case the long-term target is a four-year rotation with one-quarter of certified organic land devoted to corn, soybeans, oats/establishment alfalfa, and alfalfa. The high cost of establishing alfalfa suggests that a rotation that includes two or more years of alfalfa hay might be worth considering. This could be accomplished by lengthening the rotation to five years or by removing soybeans from the rotation and replacing it with a second year of alfalfa.

Concluding Remarks

This publication summarizes data collected during the Tools for Transition (TFT) project and shows how that data can be used to plan for the transition to organic production. The data resources and planning tools presented here complement other resources developed during the Tools for Transition project. These include [*Making the Transition to Organic: Ten Farm Profiles*](#), a collection of descriptive profiles of ten farms that have transitioned to organic production and [*Organic Transition: A Business Planner for Farmers, Ranchers and Food Entrepreneurs*](#), a comprehensive business planning resource for transitioning farmers and processors.

Not all farm operations are well suited for organic production, but it is an opportunity that is worth considering for many. The Tools for Transition project team has developed resources that will help farmers explore organic opportunities.

Appendix A: Explanation of the Method used for Negative Values in Ratio Analysis

This analysis relies heavily on the use of ratios of farm performance measures to the average performance of conventional operations in the farm's region. The median value of these ratios is reported as an indication of how farm performance on a variety of measures is likely to change as a farm progresses through the organic certification process. This method presents farm performance in relation to average regional performance and allows the pooling of production and financial data over time and geographical location. However, when this ratio method is applied to performance measures that can have negative values the process can break down, resulting in medians that are not sensible and cannot be interpreted.

For example, consider the situation in which the regional average rate of return on farm assets (ROA) is 5%. A farm in the TFT project might have achieved an ROA of 7.5%. The ratio of farm to regional ROA would be $7.5\% / 5\% = 1.5$, meaning that the farm was one and a half times as profitable as the average conventional farm in the region. Now consider the case in which the average farm in the region experienced losses and the ROA was -5%. If the TFT farm faced even heavier losses and experienced an ROA of -7.5%, the ratio of farm to regional ROA would *also* be $-7.5\% / -5\% = 1.5$. However, in this case it would be wrong to interpret the ratio as showing that the TFT farm is 1.5 times as profitable as the average conventional farm in the region. In fact, this hypothetical TFT farm is *less* profitable than the average farm in the region. This example shows that when the regional average value (the denominator of the ratio) can hold either a positive or negative value (as is the case with net return variables, profitability variables, and inventory change variables) the median ratio value cannot be considered reliable.

To address this issue we have applied the following alternative pseudo-ratio calculation to performance measures that can have negative values:

$$Ratio^* = 1 + \frac{TFT - REG}{|REG|}$$

where TFT is the TFT farm-level value, REG is the regional average value taken from conventional farms, and $|REG|$ denotes the absolute value of the regional average value.

This pseudo-ratio has the attractive property that it is equal to the simple ratio for observations where REG is positive. Using the previous example in which $TFT = 7.5\%$ and $REG = 5\%$, the ratio's value would still be 1.5. For observations in which REG is negative, this value is not equal to the simple ratio. In this case the pseudo-ratio is greater than one if the TFT farm performed better than the regional average and less than one if the TFT farm performed worse than the regional average. For example, with $TFT = -7.5\%$ and $REG = -5\%$, the pseudo-ratio's value would be 0.5, indicating that the TFT farm performed worse than the regional average. Thus, the ordering of this pseudo-ratio represents a more accurate

ordering of farm performance and the median of the distribution can be trusted as the mid-point of farm performance relative to the farm's regional average.

This technique is applied to whole-farm financial measures including net income variables, inventory change, ROA, ROE, and operating profit margin. Since this technique differs from the standard ratio construction only when the regional average value is negative, few observations are affected in the analysis of the whole-farm financial performance. It is rare that the average farm in a region experiences a loss at the whole-farm level. On the contrary, it is not uncommon for a regional average net return for a specific enterprise to be negative, meaning that more observations would be affected by the adoption of this technique in the enterprise analysis. For this reason, we have used this technique only in whole-farm analysis and simply omitted the net return variables from the enterprise analyses that can have negative values.

Appendix B: Predicted Costs and Returns for Sample Farm Enterprises

Table B1. Predicted Soybean Enterprise Costs and Returns for Sample Farm

Category	Enterprise Ratios			Region	Predicted Values		
	Conv.	Trans.	Org.		Conv.	Trans.	Org.
Yield (bushel)	1.02	0.69	0.56	\$51	52	35	28
Value per unit (bushel)	0.99	1.06	2.02	\$12	\$11	\$12	\$23
Total product return per acre	0.99	0.60	1.20	\$578	\$573	\$347	\$694
Gross return per acre	0.98	0.90	1.37	\$595	\$583	\$536	\$815
Direct Expenses							
Seed	0.94	0.96	0.50	\$54	\$51	\$52	\$27
Fertilizer	0.00	0.00	0.00	\$25	\$0	\$0	\$0
Crop chemicals	1.12	0.00	0.00	\$35	\$39	\$0	\$0
Crop insurance	0.82	0.86	0.85	\$23	\$19	\$20	\$20
Fuel & oil	1.10	1.01	1.02	\$20	\$22	\$20	\$20
Repairs	0.92	0.92	0.88	\$29	\$27	\$27	\$25
Custom hire	0.00	0.12	0.00	\$11	\$0	\$1	\$0
Operating interest	0.94	0.82	0.08	\$6	\$5	\$5	\$0
Land rent (for leased acreage)	0.83	1.00	0.41	\$213	\$176	\$213	\$87
Total direct expenses per acre (owned)	1.08	1.36	0.85	\$218	\$236	\$297	\$185
Total direct expenses per acre (leased)	1.00	1.00	0.91	\$426	\$426	\$426	\$388
Return over direct expenses per acre (owned)				\$377	\$348	\$239	\$630
Return over direct expenses per acre (leased)				\$169	\$157	\$109	\$427
Overhead Expenses							
Hired labor	0.83	0.14	0.04	\$9	\$7	\$1	\$0
Farm insurance	1.00	0.62	0.56	\$6	\$6	\$4	\$3
RE & pers. Property taxes (for owned acreage)	0.87	0.49	0.67	\$8	\$7	\$4	\$5
Dues & professional fees	0.76	0.00	0.57	\$2	\$2	\$0	\$1
Interest (for owned acreage)	0.83	1.04	0.91	\$51	\$42	\$53	\$46
Interest (for leased acreage)	0.99	0.19	0.19	\$5	\$5	\$1	\$1
Mach & bldg depreciation	0.76	0.87	0.52	\$40	\$30	\$35	\$21
Total overhead expenses per acre (owned)	0.90	1.23	1.00	\$148	\$133	\$182	\$148
Total overhead expenses per acre (leased)	0.96	1.29	1.07	\$73	\$70	\$94	\$78
Net return per acre (owned)				\$229	\$214	\$57	\$482
Net return per acre (leased)				\$96	\$87	\$16	\$350

Table B2. Predicted Oat Enterprise Costs and Returns for Sample Farm

Category	Enterprise Ratios			Region	Predicted Values		
	Conv.	Trans.	Org.		Conv.	Trans.	Org.
Yield (bushel)	1.08	0.62	0.58	\$76	82	47	44
Value per unit (bushel)	0.97	0.83	1.78	\$3	\$3	\$3	\$6
Total product return per acre	1.07	0.62	1.24	\$272	\$291	\$168	\$337
Gross return per acre	0.99	0.53	1.14	\$304	\$302	\$160	\$346
Direct Expenses							
Seed	1.42	1.51	1.33	\$26	\$36	\$39	\$34
Fertilizer	0.92	0.00	0.00	\$8	\$8	\$0	\$0
Crop chemicals	0.66	0.00	0.00	\$7	\$4	\$0	\$0
Crop insurance	0.54	0.00	0.00	\$3	\$2	\$0	\$0
Fuel & oil	0.95	0.61	0.92	\$17	\$16	\$10	\$16
Repairs	0.90	0.77	0.85	\$33	\$30	\$26	\$28
Custom hire	0.00	0.00	0.00	\$28	\$0	\$0	\$0
Operating interest	0.00	0.00	0.17	\$3	\$0	\$0	\$0
Land rent (for leased acreage)	1.00	0.87	1.18	\$155	\$155	\$135	\$183
Total direct expenses per acre (owned)	1.15	1.07	1.39	\$131	\$151	\$141	\$182
Total direct expenses per acre (leased)	1.27	0.96	1.05	\$287	\$364	\$275	\$302
Return over direct expenses per acre (owned)				\$173	\$152	\$19	\$164
Return over direct expenses per acre (leased)				\$17	-\$62	-\$115	\$44
Overhead Expenses							
Hired labor	0.28	0.00	1.96	\$8	\$2	\$0	\$16
Farm insurance	0.94	0.18	1.22	\$4	\$4	\$1	\$5
RE & pers. Property taxes (for owned acreage)	1.24	0.47	1.60	\$12	\$14	\$5	\$18
Dues & professional fees	1.12	0.54	0.99	\$2	\$2	\$1	\$2
Interest (for owned acreage)	1.98	1.86	2.48	\$36	\$71	\$66	\$88
Interest (for leased acreage)	0.82	0.70	0.91	\$3	\$2	\$2	\$2
Mach & bldg depreciation	1.12	0.60	0.63	\$25	\$28	\$15	\$16
Total overhead expenses per acre (owned)	1.63	1.26	1.50	\$114	\$187	\$144	\$172
Total overhead expenses per acre (leased)	0.94	1.24	1.28	\$37	\$35	\$46	\$48
Net return per acre (owned)				\$59	-\$35	-\$125	-\$8
Net return per acre (leased)				-\$20	-\$97	-\$161	-\$4

Table B3. Predicted Alfalfa Establishment Enterprise Costs and Returns for Sample Farm

Category	Enterprise Ratios			Region	Predicted Values		
	Conv.	Trans.	Org.		Conv.	Trans.	Org.
Yield (ton)	0.72	0.80	0.40	3	2.2	2.4	1.2
Value per unit (ton)	0.84	0.75	1.16	\$153	\$129	\$114	\$178
Total product return per acre	0.45	0.45	0.44	\$468	\$209	\$212	\$205
Gross return per acre	0.43	0.45	0.44	\$472	\$202	\$210	\$206
Direct Expenses							
Seed	0.78	0.63	0.90	\$94	\$73	\$60	\$85
Fertilizer	0.00	0.00	0.00	\$52	\$0	\$0	\$0
Crop chemicals	0.00	0.00	0.00	\$9	\$0	\$0	\$0
Crop insurance	0.00	0.25	0.00	\$2	\$0	\$0	\$0
Fuel & oil	0.76	0.45	0.62	\$47	\$36	\$21	\$29
Repairs	0.84	0.11	0.86	\$62	\$52	\$7	\$53
Custom hire	0.00	0.14	0.00	\$47	\$0	\$7	\$0
Operating interest	0.90	0.69	0.00	\$6	\$5	\$4	\$0
Land rent (for leased acreage)	0.90	0.82	0.80	\$193	\$175	\$159	\$154
Total direct expenses per acre (owned)	0.83	0.65	0.92	\$361	\$299	\$235	\$333
Total direct expenses per acre (leased)	0.87	0.50	0.77	\$538	\$471	\$270	\$412
Return over direct expenses per acre (owned)				\$111	-\$97	-\$25	-\$127
Return over direct expenses per acre (leased)				-\$66	-\$268	-\$60	-\$206
Overhead Expenses							
Hired labor	0.79	0.01	0.37	\$18	\$14	\$0	\$7
Farm insurance	0.88	0.74	0.79	\$8	\$7	\$6	\$6
RE & pers. Property taxes (for owned acreage)	1.09	0.69	0.60	\$9	\$10	\$6	\$5
Dues & professional fees	1.17	0.09	0.48	3.53	\$4	\$0	\$2
Interest (for owned acreage)	1.51	1.27	0.56	63.88	\$97	\$81	\$36
Interest (for leased acreage)	1.75	0.22	0.30	\$13	\$23	\$3	\$4
Mach & bldg depreciation	0.83	0.28	0.72	\$45	\$37	\$12	\$32
Total overhead expenses per acre (owned)	1.09	0.68	0.94	\$193	\$211	\$132	\$182
Total overhead expenses per acre (leased)	0.93	0.26	1.06	\$102	\$95	\$27	\$108
Net return per acre (owned)				-\$82	-\$308	-\$157	-\$309
Net return per acre (leased)				-\$168	-\$363	-\$87	-\$314

Table B4. Predicted Alfalfa Hay Enterprise Costs and Returns for Sample Farm

Category	Enterprise Ratios			Region	Predicted Values		
	Conv.	Trans.	Org.		Conv.	Trans.	Org.
Yield (ton)	1.00	0.96	0.81	\$5	5.3	5.0	4.2
Value per unit (ton)	1.04	1.09	1.24	\$140	\$145	\$153	\$173
Total product return per acre	1.00	1.05	0.93	\$736	\$733	\$770	\$687
Gross return per acre	1.01	1.03	0.97	\$745	\$753	\$770	\$719
Direct Expenses							
Seed	0.00	0.00	0.00	\$1	\$0	\$0	\$0
Fertilizer	0.79	0.00	0.00	\$57	\$46	\$0	\$0
Crop chemicals	0.00	0.00	0.00	\$8	\$0	\$0	\$0
Crop insurance	0.00	0.00	0.00	\$3	\$0	\$0	\$0
Fuel & oil	1.01	0.48	0.57	\$45	\$46	\$21	\$26
Repairs	0.81	0.51	0.61	\$62	\$51	\$32	\$38
Custom hire	0.00	0.00	1.34	\$60	\$0	\$0	\$81
Operating interest	0.40	0.45	0.00	\$6	\$2	\$3	\$0
Land rent (for leased acreage)	1.02	0.68	0.80	\$178	\$182	\$122	\$144
Total direct expenses per acre (owned)	1.08	0.54	0.83	\$263	\$285	\$143	\$220
Total direct expenses per acre (leased)	1.03	0.63	0.77	\$452	\$463	\$284	\$349
Return over direct expenses per acre (owned)				\$482	\$468	\$627	\$500
Return over direct expenses per acre (leased)				\$293	\$290	\$486	\$370
Overhead Expenses							
Hired labor	0.54	0.14	0.99	\$19	\$10	\$3	\$19
Farm insurance	0.91	1.07	0.69	\$8	\$7	\$8	\$5
RE & pers. Property taxes (for owned acreage)	1.22	0.97	0.91	\$8	\$10	\$8	\$7
Dues & professional fees	1.00	0.34	0.68	\$4	\$4	\$1	\$2
Interest (for owned acreage)	1.50	0.74	0.71	\$63	\$94	\$46	\$44
Interest (for leased acreage)	1.15	0.90	0.65	\$9	\$10	\$8	\$6
Mach & bldg depreciation	0.85	0.61	0.68	\$43	\$36	\$26	\$29
Total overhead expenses per acre (owned)	1.18	0.64	0.81	\$184	\$217	\$117	\$150
Total overhead expenses per acre (leased)	0.93	0.88	1.10	\$99	\$92	\$87	\$108
Net return per acre (owned)				\$297	\$251	\$510	\$350
Net return per acre (leased)				\$194	\$198	\$399	\$262