

## **Economic Analysis from the Neely-Kinyon Long-Term Agroecological Research (LTAR) Site**

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In addition to producers, governmental and financial institutions are interested in knowing the economic sustainability of organic systems. Scientific studies across the U.S. have demonstrated the economic viability of organic cropping systems without government subsidies. A sufficient level of experience with organic production systems is required, however, to reap the full benefits of such a system. Knowing the market (e.g., which crop varieties are desired for specific traits) and when to plant, manage weeds and harvest, are all part of the sophisticated thinking required in organic production.

In 1998, the Leopold Center for Sustainable Agriculture identified the need for dedicated lands throughout Iowa where research on organic practices could be conducted over the long term. The Neely-Kinyon (N-K) Long-Term Agroecological Research (LTAR) site was established to examine the agronomic and economic performance of conventional and organic systems, using required practices for certified organic production. We report here the results of the economic analysis from 1999–2001. The Neely-Kinyon Farm Association dedicated a 17-acre block for this long-term study. Treatments in the LTAR experiment were established in a completely randomized design with four replications, and included conventional Corn-Soybean (C-S), organic Corn-Soybean-Oats/Alfalfa (C-S-O/A), organic Corn-Soybean-Oats/Alfalfa-Alfalfa (C-S-O/A-A) and soybean-winter rye (S-R) where fall-planted rye was incorporated in the spring prior to planting soybeans. All crops in all rotations were grown each year on 0.25-acre plots using farm-size equipment and practices. Crop variety selection and planting methods from 1999–2001 followed the recommendations of the N-K Farm Association, which included the most suitable corn, soybean, oat and alfalfa hybrid varieties for the area. Untreated seed was used in the organic fields, per certification requirements. Oats were underseeded with leafhopper-tolerant alfalfa for the first year of the O/A-A rotation, followed by a pure stand of alfalfa in the second year. Harvests occurred within the normal harvesting period for each crop, using standard farm equipment, such as combines and hay rakes for alfalfa. Following harvest of the organic corn plots, winter rye was no-till drilled at a rate of 1 bu/acre. A hay crop (alfalfa, fescue and oats) was seeded in the 30-ft border strips around each plot and around the perimeter of the experiment and maintained as the required buffer between conventional and organic production, per certification standards. Organic fields were fertilized to provide equivalent rates of nitrogen as in conventional fields (120–150 lb/acre N, depending on stalk nitrate results from previous years) with locally-produced swine hoop-house compost from the ISU Armstrong Research and Demonstration Farm. Weeds were managed in the organic corn and soybean fields through cultivation. Because rye provides natural allelopathic chemicals that mitigate weed seed establishment in soybean production, a winter rye crop was planted prior to soybean. In addition, soybean fields “walked” (large weeds above

soybean canopy hand-pulled in a continuous walking movement across fields) to remove any potentially staining weeds that would reduce the market value of the clear-hilum varieties destined for the tofu market. Conventional fields were fertilized and pests were managed following Iowa State University recommendations. Machinery and input cost of production were determined by applying standardized cost estimates, determined annually for Iowa conditions, to the cultural practices in each rotation. Herbicide and insecticide price data were obtained from unpublished price lists from suppliers where inputs were purchased. Average treatment yields for the 3-year period were tested for statistical significance using analysis of variance (ANOVA). Following determination of significance, Tukey's multiple range test (HSD) was used for testing statistical differences among individual crops.

Average production costs for the conventional C-S rotation were \$33/acre higher than the organic C-S-O/A rotation (\$163 versus \$130) and \$48/acre higher than the organic C-S-O/A-A rotation (\$163 versus \$115). In these rotations, the cost of seeding the alfalfa crop is included with the cost of oat seed. Savings from the absence of fertilization and pesticide costs in the organic rotations were greater than overall increased machinery and seed expenses.

Variation in weather, varieties, and other conditions did affect the variability in yields from year to year. The differences among rotations, however, remained relatively stable, resulting in poor ANOVA modeling results and the inability to make statistically significant comparisons and statements. The conventional C-S average corn yield of 138 bu/acre was not significantly higher than the organic C-S-O/A average corn yield of 130 bu/acre or the organic C-S-O/A-A yield of 133 bu/acre. Soybean yield averages ranged from 41 bu/acre (C-S-O/A) to 44 bu/acre (C-S-O/A-A). Oat yield averages ranged from 75 bu/acre (C-S-O/A-A) to 78 bu/acre (C-S-O/A). Alfalfa yield averaged 2.9 tons/acre. Average returns to land, labor, and management for corn within the organic C-S-O/A and C-S-O/A-A rotations were not significantly different at \$264/acre and \$272/acre, respectively. Both returns were significantly higher than the return for the conventional C-S rotation (\$51/acre). Returns for soybeans within the organic C-S-O/A and C-S-O/A-A rotations were not significantly different at \$470/acre and \$505/acre, respectively. Again, both organic returns were significantly higher than the return for the conventional C-S rotation (\$95/acre). Analysis of the returns to the rotations over 3 years revealed that the organic C-S-O/A and C-S-O/A-A rotations were not significantly different at \$286/A and \$290/A, respectively. The average returns to the conventional C-S rotation was significantly lower at \$73/A. Our study indicates that organic rotations are competitive with conventional C-S rotations under normal conditions of on-farm labor and management. As compost costs increase from \$20/T to \$40/T, the addition of alfalfa (C-S-O/A-A) in the organic rotation is necessary to remain competitive with conventional C-S rotations.

### **Publications Resulting From This Work**

Delate, K., M. Duffy, C. Chase, A. Holste, H. Friedrich, and N. Wantate 2003. An economic comparison of organic and conventional grain crops in a long-term agroecological research (LTAR) site in Iowa. *The American Journal of Alternative Agriculture* 18 (2): 59–69.