

THE ORGANIC AND NON-GMO REPORT

Research shows organic corn, soybean yields can exceed conventional

Iowa State University project shows yields of organic corn and soybeans equal or exceed conventional production while producing twice the revenue

By Bob Turnbull, associate editor

In response to the growth of the organic food and fiber sector, some observers have concluded that a major shift to organic production methods would result in decreased yields leading to catastrophic food shortages. These conclusions are often supported by extrapolating the data collected in various experiments conducted over a number of years and in diverse growing regions where organic yields of a range of crops and animal production have been found to be less than their conventional counterparts. Such comparisons may provide some useful baseline information of early organic performance but they are historical in nature and some relatively old data is utilized.

Beyond noting historical yield lags, however, such reviews are flawed in several key respects. The authors seem to assume that, absent some form of corrective action, there will be a major shift to organic production over a short period and organic yields cannot be improved. Since about 98% of agriculture is considered “conventional,” a sudden jump to organic production is highly unlikely and, as researchers and producers can document, yields can and are improving.

Additionally, these assumptions often tend to be alarmist, especially when the issue of food shortages and hunger are raised as a result if organic production is the dominant form of agriculture. Moreover, such pronouncements reflect an absence of appreciation for the innovative capabilities of producers, researchers, value-chain partners, and consumers.

Long Term Agroecological Research

An example of the innovation of producers and researchers can be found at the Long Term Agroecological Research (LTAR) site in Greenfield, Iowa where organic yields are improving and sometimes exceeding conventional yields. This experiment is situated on approximately 17 acres of productive soils at the Neely-Kinyon Research Farm where Iowa State University (ISU) associate professor Dr. Kathleen Delate established 44 plots covering a quarter-acre each to compare organic and conventional crops. In production for the past 12 years, Dr. Delate, her student assistants, USDA-ARS Soil Tilth Lab, and the ISU Experiment Station staff have collected a vast amount of data comparing a wide array of performance parameters. Guided by suggestions provided by producer groups in Iowa, annual collection of data has focused on soil quality, fertility, nitrogen utilization, weed control, insect and disease pressure and control, and yields. Corn and soybeans are the crops generating the most interest. Wheat, alfalfa, oats, red clover and rye are utilized in the required organic rotation and provide benefits in terms of fertility, and weed control, and as cash crops.

12 years comparing organic and conventional production

The LTAR was designed to limit bias and confounding factors via a completely randomized plot assignment in the experimental design in order to raise confidence when drawing conclusions from the study. Also, at the suggestion of producers, the plots are of sufficient size to use farm-sized equipment to fertilize, plant, cultivate, and harvest the crops. The goal was to simulate conditions of production agriculture.

The 12-year experiment has proven to be a microcosm of the experience of larger scale producers who have adopted organic agriculture. From planting dates, maintaining fertility, managing weeds, soybean aphids and bean leaf beetles, to harvest and marketing, Dr. Delate and her staff have taken an active role in many aspects of the overall system.

All crops in all rotations are grown each year of the experiment in order to take into account annual weather effects on production and yield, and all plots are replicated four times. The organic crops are certified by the Iowa Dept. of Agriculture and Land Stewardship Organic Program, which inspects all fields, equipment, and records on an annual basis. When possible, crops are marketed as certified organic, to conduct a realistic annual economic analysis. Crop varieties are identical between organic and conventional plots in order to remove any bias from superior genetics in one system over the other. All seed planted in organic plots is certified as organic. Crop rotations in the LTAR include the following: 1) Conventional corn-soybean; 2) organic corn-soybean-oats/alfalfa; 3) corn-soybean-oats/alfalfa-alfalfa; and 4) organic soybean-winter wheat (with a frost-seeded soil-building crop of red clover). The 4th rotation has been the least productive system and will be eliminated from the experiment next year.

Organic corn and soybean yields exceeded conventional

Typical of transitioning organic fields, organic corn yields were less than conventional during the first two years of the LTAR experiment. By the third year organic and conventional corn yields were about equal. In the fourth year organic corn yields averaged across all rotations was 130 bushels per acre and greater than the conventional corn yield of 112 bushels per acre in the corn-soybean rotation. Similarly organic and conventional soybean yields were similar in the years of transition and by the fourth year, the organic soybean yield of 45 bu/ac exceeded the conventional yield of 40 bu/ac. Over 12 years of the experiment, the average conventional corn yield has been 171 bu/ac and 163 bu/ac for organic. The 12 year average for conventional and organic soybeans is an identical 47 bu/ac. If the transition period is eliminated from the averages, the conventional and organic yields are statistically identical at 172 bu/ac for conventional corn and 170 bu/ac for organic corn and 47 bu/ac for organic and conventional soybeans despite the consistently underperforming fourth organic rotation.

Regarding economic performance, even during the first two years of organic transition, average production costs in the conventional corn-soybean rotation were found to be approximately \$50/ac higher than the average organic rotation costs. This decrease in costs in the organic rotation was due to the absence of petroleum-based fertilizers and pesticides (herbicides, insecticides and fungicides). On average, the organic crops have returned two times the revenue as conventional crops over the duration of the experiment.

Though not without its challenges, the LTAR has succeeded in demonstrating that yields of corn and soybeans grown in compliance with the rules of USDA's National Organic Program can equal or exceed those grown using conventional methods.

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