

Literature Survey of Studies
Comparing Organic vs.
Conventional Farming Methods

Format of Presentation

Primary Researcher(s): Lead author(s) I could find during literature survey

Institution: Institution carrying out the research

Journal or Reference: Publication and/or URL

Funding Source: Institution which funded the study

Crops: Primary crops in study

Length of Study

Description: Brief summary of project

Findings: Brief summary of key findings

Disclaimer!

This is in no way to be taken as an exhaustive literature survey. Also, this is not intended to convince anyone to support or not support any particular viewpoint.

CASE 1

Primary Researcher(s): David Pimentel

Institution: Cornell University

Journal or Reference: Bioscience (Vol 55:7)

<http://www.news.cornell.edu/stories/July05/organic.farm.vs.other.ssl.html>

Funding Source: Rodale Institute

Crops: Corn and Soy

Length of Study: 22 years

Description: The study compared a conventional farm that used recommended fertilizer and pesticide applications with an organic animal-based farm (where manure was applied) and an organic legume-based farm (that used a three-year rotation of hairy vetch/corn and rye/soybeans and wheat). The two organic systems received no chemical fertilizers or pesticides.

Findings:

- Yields for corn and soy were the same between organic & conventional
- Organic used 30% less energy, and less water
- Organic resulted in less groundwater pollution & less erosion
- Corn yields were lower by 1/3 in the organic fields during first 4 years
- Yields in legume based system were 22% higher during drought years (1988-1998)
- Soil carbon in organic system increased by 15-28%
- Soil nitrogen in organic system increased by 8-15%. Nitrate leaching was equivalent in both systems.
- Author felt organic can compete in corn, soy, wheat, barley and other grains, but not in cash crops.

CASE 2

Primary Researcher(s): Mike Duffy, professor Department of Economics; Matt Liebman, professor Department of Agronomy; Ken Pecinovsky, farm superintendent

Institution: Iowa State University

Journal or Reference: ISRF02-13

<http://www.ag.iastate.edu/farms/02reports/ne/OrganicConvSystems.pdf>

Funding Source: ?

Crops: Corn, Oats, Alfalfa, Soy

Length of Study: 3 years (2000-2002), however fields had been in use for related study (different organic crop rotation) since 1977 (see below)

Description: This study was undertaken at the Northeast Research and Demonstration Farm. The original organic system was two corn-oat-alfalfa (C-O-A) rotations with the alfalfa seeded as a companion crop with oats in the second year of the rotation. One of the C-O-A rotations received livestock manure, and the second did not. In 1999, the organic C-O-A rotations were converted to three new organic crop rotations: corn-soybean-oat-alfalfa (C-SB-O-A), soy-bean-oat/annual ryegrass (SB-O/AR), and corn-annual alfalfa (C-A). The annual ryegrass, seeded after oat harvest, is used as a “soil building” crop. The annual (non-dormant) alfalfa, which is grown with an oat companion crop, is used as a “green manure” N-supplying crop. Although the original organic rotations have been changed, the conventional crop rotations, continuous corn (C-C) and corn-soybean (C-SB), remain intact. Half of the C-C plots receive spring injected livestock manure, and the other half receive spring injected anhydrous ammonia. The conventional rotations receive herbicides, insecticides, and commercial fertilizer as determined by soil analysis.

Findings: see table on next page

CASE 2 (Cont.)

Yield Results (Bushels/acre?)

System	2002	2001	2000	1999 (wet)	00-02 avg.
<u>Organic C-SB-O-M rotation</u>					
Corn	183.0	156.0	164.5	70.5	167.8
Conventional soybean variety	50.7	35.0	59.0	38.8	48.2
Food grade soybean variety	38.9	26.1	47.7	30.3	37.6
Oats	114.6	65.9	63.8	82.3	81.4
Alfalfa	4.15	2.71	3.70	3.17	3.52
<u>Organic SB-O/AR rotation</u>					
Conventional soybean variety	49.7	25.7	57.3	54.4	44.2
Food grade soybean variety	34.0	20.6	45.5	38.3	33.4
Oats/annual rye	123.6	60.7	76.1	79.8	86.8
<u>Organic C-A rotation</u>					
Corn	182.8	141.1	176.3	59.0	166.7
Oats/annual alfalfa	108.4	81.0	—	—	94.7
<u>Conventional C-SB rotation</u>					
Corn	193.1	166.2	168.1	158.3	175.8
Conventional soybean variety	44.8	46.7	55.5	49.5	49.0
Food grade soybean variety	34.3	33.7	42.3	36.8	36.8
<u>Conventional C-C</u>					
Cont. corn (NH3)	184.4	141.8	156.2	127.5	160.8
Cont. corn (manure only)	194.8	125.1	162.7	—	160.9

CASE 3

Primary Researcher(s): John Reganold

Institution: Washington State University

Journal or reference: Online, Crop Management doi:10.1094/CM-2006-0921-16-PS.
<http://www.plantmanagementnetwork.org/pub/cm/symposium/organics/Reganold/>

Funding Source: USDA

Crops: Apples

Length of Study: 6 growing seasons (1994-1999)

Description: Study compared yields, economics, soil quality, and other factors resulting from apples grown using organic, conventional, and integrated methods. There were 4 replications of each treatments: Each of the twelve experimental plots were 0.14 ha (0.33 acre) and consisted of four rows (spaced 1.4 m apart) each 80 trees (spaced 3.2 m) long trained on a three-wire trellis system for a density of 2240 trees/ha (903 trees/acre).

Findings:

- Tree growth was identical for all systems
- Yield: Apples are bi-annual and yield tends to be high one year, and low the next. Conventional yields were highest in 1996. Organic were higher in 1997-98. Organic was lowest in 1999. Cumulative yield from 1995-1999 showed no statistical difference.
- Organic apples were smaller than conventional (tends to be financially detrimental to grower). Organic firmness was always greater or equal to conventional.
- Organic break-even point was projected to occur sooner than conventional due to price premium
- Organic energy efficiency was about 7% higher than conventional, and 5% higher than integrated.

CASE 4

Primary Researcher(s): Kathleen Delate (Iowa State University), Cynthia A. Cambardella (USDA)

Institution: Iowa State University

Journal or reference: Online, Institute of Science in Society
<http://lists.ifas.ufl.edu/cgi-bin/wa.exe?A2=ind0412&L=sanet-mg&P=8813>

Funding Source: ?

Crops: Corn & Soybean

Length of Study: 4 years – 3 years to transition to organic + 1 year certification

Description: The study assessed the agroecosystem performance of farms during the three-year transition it takes to switch from conventional to certified organic grain production.

Findings:

- Over 4 year period:
 - Organic corn yield averaged 91.8% of conventional
 - Organic soybean yield average 99.6% of conventional
- Year 3: no statistical difference in yields between organic and conventional (both corn & soy)
- Year 4: organic yield exceeded conventional (both corn & soy)
- In the initial year of transition, an economic advantage could be gained by planting legume hay crops or crops with a low nitrogen demand in fields with low productivity, to increase fertility for the following corn crop. In the second year, yield differences were mitigated by rotation effects and compost application, providing sufficient nutrients for the organic grain crop.

CASE 5

Primary Researcher(s): Daniel Anand Raj, K. Sridhar, Arun Ambatipudi, H. Lanting, & S. Brenchandran

Institution: ETC Organic Cotton Programme, India.

Journal or reference: Second International Symposium on Biological Control of Arthropods
<http://www.bugwood.org/arthropod2005/vol1/6c.pdf>

Funding Source: ?

Crops: Cotton

Length of Study: 1 year

Description: Cotton yields, profits and pest incidence at fields of farmers partaking in an export oriented organic cotton production program are compared with yields of conventional cotton production in the same village during a bad cotton season (2004). Late season drought reduced actual yield by 42% compared to the estimated yield in October 2004 and usual average yields. Thirty-four farmers, part of a large organized group (over 200 farmers), volunteered to test organic cotton on part of their farm, allotting 79 acres for organic farming though owning about 296 acres. Conducted in in the district of Karimnagar, Andhra Pradesh.

Findings:

- Organic cotton yielded on par at 232 Kg seed cotton /acre vs. conventional cotton at 105 Kg/acre.
- Organic cotton was more profitable at +Rs 559/acre (approx. US \$ 13) (1 US\$ = Rs. 44) versus -Rs 1307/acre (minus US\$ 30) in conventional cotton.
- Pest control in organic cotton was about Rs. 220 per acre vs. Rs. 1624 per acre in conventional cotton.
- Article states: "These conclusions are based on one, bad cotton season. All conclusions are thus to be considered with caution. Different rainfall patterns and quantities can lead to very different results. It must be recommended to compare organic and conventional production for a number of years."

CASE 6

Primary Researcher(s): Paul Mader, et. al.

Institution: Institute of Organic Agriculture and the Swiss Federal Research Station for Agroecology and Agriculture

Journal or reference: Published in Science

<http://news.bbc.co.uk/1/hi/sci/tech/2017094.stm>

Funding Source: ?

Crops: potatoes, barley, winter wheat, beet, and grass clover

Length of Study: 21 years, beginning in 1978

Description: Study compared plots of cropland grown according to both organic and conventional methods.

Findings:

- Organic yields were less by about 20%
- Fertilizer use was less by 34% in organic as compared to conventional
- Energy use was less by 53% in organic as compared to conventional
- Pesticide use was less by 97% in organic as compared to conventional
- Organic soils housed a larger and more diverse community of organisms