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Organic Bibliography with annotations

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Organic vs. Conventional: Nutrient Management

L. R. Bulluck, III a, 1, M. Brosiusb, G. K. Evanylob and J. B. Ristaino. Organic and synthetic fertility amendments influence soil microbial, physical and chemical properties on organic and conventional farms. Applied Soil Ecology. Volume 19, Issue 2, February 2002, Pages 147-160

Alternative fertility amendments enhanced beneficial soil microorganisms, reduced pathogen populations, increased soil organic matter, total carbon, and cation exchange capacity (CEC), and lowered bulk density thus improving soil quality.

Kramer, S.B., J.P. Reganold, J.D. Glover, B.J.M. Bohannan, and H.A. Mooney. 2006. Reduced nitrate leaching and enhanced denitrifier activity and efficiency in organically fertilized soils. Proceedings National Academy of Sciences 103:4522-4527.

This 2006 study reported reduced N pollution from organic and integrated farming systems compared with a conventional farming system. Annual nitrate leaching was 4.4–5.6 times higher in conventional plots than in organic plots, with the integrated plots in between. This study demonstrates that organic and integrated fertilization practices support more active and efficient denitrifier communities, shift the balance of N2 emissions and nitrate losses, and reduce environmentally damaging nitrate losses.

McIsaac. G.F., and R.A. Cooke. 2000. Evaluation of Water Quality from Alternative Cropping Systems Using a Multiple-Paired Design
www.aces.uiuc.edu/~asap/research/stew_farm/home.html

*In a study which compared the water quality from organically and conventionally managed fields, the authors concluded: "On average, nitrate and chloride concentrations in samples of drainage water from organic fields monitored in this study were significantly less than the concentrations from conventionally managed fields with similar characteristics**….. It appears the organic farming practices have considerable potential for reducing nitrate transport to surface water."***

Fundamental Differences Between Conventional and Organic Tomato Agroecosystems in California. L. E. Drinkwater, D. K. Letourneau, F. Workneh, A. H. C. van Bruggen, C. Shennan. *Ecological Applications*, Vol. 5, No. 4 (Nov., 1995), pp. 1098-1112

Conventional and organic systems could not be distinguished based on agronomic criteria such as fruit yield and arthropod pest damage levels. However, differences were demonstrated in many soil, plant, disease, and diversity indicators suggesting that the ecological processes determining yields and pest levels in these two management systems are distinct. In particular, nitrogen mineralization potential and microbial and parasitoid abundance and diversity were higher in organic farms.

Reganold, J. P., J. D. Glover, P. K. Andrews, and H. R. Hinman. 2001. Sustainability of three apple production systems. Nature. 410:926-930.

When compared with the conventional and integrated systems, the organic system produced sweeter and less tart apples, higher profitability and greater energy efficiency. Our data indicate that the organic system ranked first in environmental and economic sustainability, the integrated system second and the conventional system last.

Wander, M.M, and E. E. Marriot. 2006. Total and Labile Soil Organic Matter in Organic and Conventional Farming Systems. Emily E. Marriot and Michelle M. Wander
Soil Science Society of America Journal, Vol. 70:950-959. Online April 19, 2006.

This study summarizes the findings of nine long-term comparative trials assessing the impacts of conventional and organic cropping systems on soil quality. Overall, ***organic management "increased SOC concentrations approximately 14% above values found in conventional systems after an average of 10 yr."*** *The* ***authors noted that "these gains in soil organic carbon under organic management occurred despite the relatively heavier reliance by organic farmers on cultivation for weed control."***

Organic vs. Conventional: Biodiversity

Janne Bengtsson, Johan Ahnström and Ann-Christin Weibull. The effects of organic agriculture on biodiversity and abundance: a meta-analysis. *Journal of Applied Ecology*. Volume 42 Page 261-269. April 2005

This study reviewed 66 pre-2002 articles for comparison of biodiversity between organic and conventional farms: On average, organisms were 50% more abundant in organic farming systems, but the results were highly variable between studies and organism groups. Birds, predatory insects, soil organisms and plants responded positively to organic farming, while non-predatory insects and pests did not.

Beecher, NA; Johnson, RJ; Brandle, JR; Case, RM; Young, LJ. 2002. Agroecology of birds in organic and nonorganic farmland. *Conservation Biology*. 16:6:1620-1631.

Ecological relationships between wildlife conservation and farm management provide common ground for the enhancement of bird habitat and the natural suppression of pests on farmland. We compared bird populations in 15 paired organic and nonorganic sites (cornfields plus edges, 30 sites total) that were similar in environment and edge habitat but that differed in use of fertilizers, herbicides, cultivation, and crop rotations. …we recorded 54 bird species, 51 in organic and 39 in nonorganic sites. On average, bird abundance on organic sites was 2.6 times higher than on nonorganic sites, and mean species richness per visit was 2.0 times greater. When analyzed separately, organic edge, perimeter, and field transects supported higher bird abundance and greater richness than did their nonorganic counterparts. Abundance and richness were higher on organic sites for insectivores, omnivores, and granivores, and for each of three migratory groups. Twelve species were individually more abundant on organic sites, and one regularly observed species was observed only on organic sites. No species had greater abundance on nonorganic sites.

Kremen, C., N. M. Williams, R. L. Bugg, J. P. Fay and R. W. Thorp. 2004. The area requirements of an ecosystem service: crop pollination by native bee communities in *California. Ecology Letters*, 7:1109-1119.

Liat P. Wickramasinghe, et al., "Bat Activity and Species Richness on Organic and Conventional Farms: Impact of Agricultural Intensification," *Journal of Applied Ecology*, Vol. 40 (2003).

Bat activity is 61% higher on organic farms, and foraging activity is 84% higher on organic farms than on conventional farms. Insects were 64 percent more abundant on organic farms versus conventional ones.

The Biodiversity Benefits of Organic Farming. 2000. UK Soil Association, at: http://www.soilassociation.org/web/sa/saweb.nsf/24ffc96e2350a4e680256ab10047def0/67bff1084a5b1d0880256ae50039d8cb/$FILE/Biodiversity%20Report.pdf

In a review of 9 studies, the UK's Soil Association found that both abundance and diversity were substantially higher on organic farms than comparable conventional farms. ***Plants****--Five times as much biomass of wild plants in arable fields, two times as many rare or declining wild plant species and several rare species found only on organic farms.* ***Birds****—25% more birds at the field edge, 44% more in-field in autumn/winter.* ***Invertebrates****—1.6 times as many of the arthropods that comprise bird food, three times as many non-pest butterflies and 1-5 times as many spiders in the crop area.*

Pfiffner, Lukas; Häring, Anna; Dabbert, Stephan; Stolze, Matthias and Piorr, A. (2001) Contributions of organic farming to a sustainable environment. Paper presented at European Conference - Organic Food and Farming, Copenhagen, Denmark, 10.-11.05.2001; Published in *Organic Food and Farming. Towards Partnership and Action in Europe. 10-11 May 2001, Copenhagen, Denmark*, page pp. 115-123. Dänish Ministry for Food, Agriculture and Fisheries. http://orgprints.org/2943/01/pfiffner-2001-proceedings-copenhagen.pdf

This study reviewed 41 studies, looking at environmental indicators such as Biodiversity & Landscape, Soil, Ground and Surface Water, Climate and Air, as well as Farm Input and Output. For each indicator organic farming is ranked at least equal to conventional farming, while in the majority of environmental indicators organic farming performs better or much better. In two cases, the subjective confidence interval could allow conventional farming to appear as the preferable system (partly due to the lack of evident data). However, when considering the aggregation level of the indicator categories, the analysis becomes more uniform. With the exception of climate and air, organic farming performs better than conventional farming in all categories. None of the indicator categories showed that organic farming performed worse.

Klingen,-I; Eilenberg,-J; Meadow,-R. Effects of farming system, field margins and bait insect on the occurrence of insect pathogenic fungi in soils. *Agriculture,-Ecosystems-and-Environment*. 2002; 91(1/3): 191-198 PB:

A method for baiting soil samples with Delia floralis larvae was developed, and a systematic survey was conducted on soils from northern Norway for insect pathogenic fungi, using D. floralis and Galleria mellonella larvae as bait. The occurrence of insect pathogenic fungi in soils from arable fields and adjacent field margins of conventionally and organically managed farms was compared. The study showed a significantly higher

occurrence of insect pathogenic fungi in soils from arable fields of organically managed farms.

Organic vs. Conventional: Yields

Brumfield, R.G., A. Rimal, and S. Reiners. 2000. Comparative cost analyses of conventional, integrated crop management, and organic methods. HortTech 10:785-793.

Dobbs, Thomas L. and James D. Smolik. 1996. "Productivity and profitability of conventional and alternative farming systems: A long-term on-farm paired comparison." *Journal of Sustainable Agriculture* 9(1):63-79.

Drinkwater, L. E., Letourneau, D. K., Workneh, F., van Bruggen, A. H. C., Shennan, C. Fundamental Differences Between Conventional and Organic Tomato Agroecosystems in California *Ecological Applications*, Vol. 5, No. 4 (Nov., 1995), pp. 1098-1112

Entz, M.H., et al. 2002. Glenlea long-term crop rotation study: a comparison of organic and conventional systems. In Proceedings, 14th IFOAM Organic World Congress, Aug. 21-24, 2002, Victoria, Canada. p. 119.

"The best overall performance was recorded for the alfalfa-containing cropping system conducted under organic management." (this study site is in Canada. corresponding author A. Schoofs, schoofsa@ms.umanitoba.ca)

Goldstein, Walter. Developing and testing nutrient and organic matter budgeting and practices that will reduce the leaching of nutrients into surface and groundwaters. 2003? In The Wisconsin Integrated Cropping Systems Trial—Ninth Report. pp. 82-105. Contact Walter at phone (262) 642-3303; ext. 112, e-mail wgoldstein@MichaelFieldsAgInst.org, and read a similar report on the web at http://www.misa.umn.edu/Other/symposium/Goldstein%20Proceedings%2003.pdf

An "organic matter and nutrient budgeter" computer program was developed to project nitrogen release in various cropping scenarios. The budgeter was tested in on-farm trials in Wisconsin, Iowa, and Illinois. Corn root health was also assessed. Data from farms was grouped into 8 different management systems, 4 organic and 4 conventional. Corn seems to rely primarily on soil organic matter for N source rather than on applied nitrogen inputs. Fertilization with mineral N fertilizer increased N uptake in corn only 11%, while fertilization with manure increased N uptake by only 10%. In this study, conventional yields were slightly lower than organic, though not significantly so. An exception was corn grown after small grains/clover, which produced unusually low yields (79 bu/acre). Corn growth was stunted, root production was low, and corn encountered strong weed competition. Organic corn after alfalfa-grass mixtures yielded unusually well (153 bu/acre).

Granstedt, A. and L. Kellenberg. 1997. Long-term field experiment in Sweden: effects of organic and inorganic fertilizers on soil fertility and crop quality. (In Proceedings of an International Conference in Boston, Tufts University, Agricultural Production and Nutrition, Massachusetts March 19-21, 1997.) on the web at http://www.jdb.se/sbfi/publ/boston/boston7.html

In 1958, Bo D. Pettersson in the Nordic Research Circle for Biodynamic Farming in Järna, Sweden, began an agricultural field experiment that lasted until 1990, i.e. 32 years. The field experiment included eight different fertilizer treatments, each with a four-year crop rotation without repetitions: summer wheat, clover/grass mix, potatoes, beets…./ In these experiments a comparison was made between two systems, biodynamic farming and conventional farming, in which both fertilizer regimes and crop rotations were studied…. During the time between 1958 and 1990 the yield increased in all treatments in accordance with the overall trend in the Swedish agriculture, but the increase was highest in the organic treatments (65 % in the biodynamic in comparison with 50 % in the conventional).

Hanson, James C., Erik Lichtenberg, and Steven E. Peters. 1997. "Organic versus conventional grain production in the mid-Atlantic: An economic and farming system overview." *American Journal of Alternative Agriculture* 12(1):2-9.

Letourneau, D.K. and B. Goldstein. 2001. Pest damage and arthropod community structure in organic vs. tomato production in California. J. Appl. Ecol. 38:557.

"Letourneau and Goldstein have studied tomato production on 18 commercial farms (half of them managed organically) in the Central Valley of California; they find that the withdrawal of synthetic insecticides does not lead to increased crop losses as a result of pest damage."

Lotter, D.W. Organic agriculture. 2003. J. Sustain. Agric. 21(4). On the web at http://www.donlotter.com/lotter_organicag.pdf

"Yield reductions of [organic] systems average 10-15% relative to [conventional], however these are generally compensated for by lower input costs and higher gross margins." Also features a 381-citation literature review of organic research.

Mader, P., A. Fließbach, D. Dubois, L. Gunst, P. Fried, U. Niggli. 2002. Soil fertility and biodiversity in organic farming. Science 296:1694-1697.

NPK nutrient input was 34-51% lower in organic than in conventional systems, while yields averaged 20% lower over the 21-year study period. This is interpreted as the organic system being more efficient than the conventional. Energy required to produce "a crop dry matter unit" was 20-56% lower in organic than conventional systems, and 36-53% lower per unit of land area. Organic potato yields were 58-66% lower than conventional potato yields, due to low K supply and infection with Phytophtora infestans. Organic winter wheat yields were 90% of conventional yields. Soil aggregate stability was 10-60% higher in organic than in conventional plots. Soil pH was slightly higher in the organic systems. Root length colonized by mycorrhizae was 40% higher in organic than conventional systems. Earthworm biomass and abundance was 1.3-3.2 times higher in organic compared to conventional plots. "Average activity density of carabids, staphylinids, and spiders in the organic plots was almost twice that of the conventional plots."

Mendoza, T.C. 2002. Comparative productivity, profitability and energy use: intensity and efficiency of organic, LEISA, and conventional rice production in the Philippines. In Proceedings, 14th IFOAM Organic World Congress, Aug. 21-24, 2002, Victoria, Canada.

p. 2: "The case study had shown that rice grown the organic method … was more profitable and less cash capital requiring." … Organically grown rice also utilized significantly low amount of fossil fuel energy, thus, it was also the most energy efficient method of growing rice."

Miller, P., and D. Buschena. 2003. Agroeconomic analyses of the transition period to organic and no-till diversified cropping systems in the northern Great Plains. Handout from Tri Societies meeting, Denver, CO, Dec. 2003.

Compares yields, precipitation use efficiency, and net returns of 1 organic and 4 no-till rotations, after 4 years. Winter wheat water use was the same under organic and no-till management. After 4 years, organic winter wheat yields averaged 103% of the no-till winter crop treatment and 125% of the highly diversified no-till rotation treatment. In the short-term, the highly diverse rotation did not yield as highly as expected, largely because of the decline in wheat yield two years after sunflower! Sunflower yields, however, were large enough to justify keeping them in the rotation. Organic crop production was economically competitive with no-till systems during the transition.

Petersen, C., L. E. Drinkwater, and P. Wagoner. 1999. The Rodale Institute Farming Systems Trial: the first 15 years. Kutztown, PA: The Rodale Institute.

Corn yields were initially lower under organic than conventional management, but then increased to equivalent yields. "After a transition period, the organic systems produced better corn crops than the conventional system in dry years." "On average, soybean yields in both organic systems have been as high as those in the conventional system…" "In general, yields of wheat, oats, barley, hay, and corn grown for silage … were comparable to the [county] average …"

Porter, P.M., D.R. Huggins, C.A. Perillo, S.R. Quiring, and R.K. Crookston. 2003. Organic and other management strategies with two- and four-year crop rotations in Minnesota. Agron. J. 95:233-244.

After 6 years, organic corn yields were 7-9% less than conventional, while organic soy yields were 16-19% less than conventional.

Reganold, J.P., J.D. Glover, P.K. Andrews, and H.R. Hinman. 2001. Sustainability of three apple production systems. Nature 410:926-930.

Compares organic, conventional, and "integrated" apple production in Washington state. "All three systems gave similar apple yields. The organic and integrated systems had higher soil quality and potentially lower negative environmental impact than the conventional system."

Stanhill, G. (1990). The comparative productivity of organic agriculture. Agriculture, Ecosystems and Environment, 30, 1-26.

Welsh, R. 1999. The economics of organic grain and soybean production in the Midwestern United States. Henry A. Wallace Inst. for Alt. Agric. Policy Studies report No. 13.
Reviews Midwestern organic grain and soybean research. Excellent background on earlier organic research in the U.S.

Nutrition: Organic vs. Conventional

Worthington, V. 2001. Nutritional Quality of Organic Versus Conventional Fruits, Vegetables, and Grains. The Journal Of Alternative And Complementary Medicine Volume 7, Number 2, 2001 PP. 161—173

Asami, D.K., Hong, Yun-Jeong, Barrett, D.M, and A.E. Mitchell. 2003. Comparison of the Total Phenolic and Ascorbic Acid Content of Freeze-Dried and Air-Dried Marionberry, Strawberry, and Corn Grown Using Conventional, Organic, and Sustainable Agricultural Practices. J. Agric. Food Chem., 51 (5), 1237 -1241, 2003.

Mitchell, A.E., Hong, Yun-Jeong, Koh, E., Barrett, D.M., Bryant, D. E., Denison, R. F., and S. Kaffka. 2007. Ten-Year Comparison of the Influence of Organic and Conventional Crop Management Practices on the Content of Flavonoids in Tomatoes. J. Agric. Food Chem., 55 (15), 6154 -6159, 2007.

L. Rist, A. Mueller, C. Barthel, B. Snijders, M. Jansen, A.P. Simoes-Wust, M. Huber, I. Kummeling, U. von Mandach, H. Steinhart and C. Thijs. 2007. Influence of organic diet on the amount of conjugated linoleic acids in breast milk of lactating women in the Netherlands. British Journal of Nutrition. April 2007, Volume 97, Issue 4, Pages 735-743

M.L. Amodio, G. Colelli, J.K. Hasey, A.A. Kader. 2007. A comparative study of composition and postharvest performance of organically and conventionally grown kiwifruits. Journal of the Science of Food and Agriculture. Page 8. March 27.

Pesticide Residues:

Baker, BP, CM Benbrook, E Groth III and KL Benbrook. 2002. Pesticide residues in conventional, integrated pest management (IPM)-grown and organic foods: insights from three US data sets. Food Additives and Contaminants 19 (5): 427–446.