

Introduction to Organic Transition Experiment Center for Environmental Farming Systems

Nancy Creamer¹, Mary Barbercheck², Melissa Bell³, Cavell Brownie⁴, Alyssa Collins⁶,
Ken Fager¹, Joel Gruver⁵, Shuijin Hu⁶, Lisa Jackson², Nick Kuminoff⁷, Mike Linker³,
Frank Louws⁶, David Monks¹, Paul Mueller³, David Orr², Jessica Seem¹, Cong Tu⁶,
Ada Wossink⁷, Steve Koenning⁶, Michael Waggener⁵
Departments of ¹Horticultural Science, ²Entomology, ³Crop Science, ⁴Statistics, ⁵Soil
Science, ⁶Plant Pathology, ⁷Agriculture and Resource Economics
North Carolina State University
Raleigh, NC 27695

The overall goal of this research was to investigate various strategies, from a biological and economic systems perspective, for making the transition from conventional to organic systems of agricultural production. While some studies have documented soil, biological, and economic changes that occur during transition, this study investigated a range of specific strategies aimed at a better understanding of the many interacting factors during this critical period. Five strategies of transition are being evaluated and compared to a conventional control: immediate substitution of all conventional inputs with organic management practices and inputs; substitution of one of the major classes of inputs (fertilizer, herbicide, pesticides (insecticides & fungicides)) in the first two years, followed by a third year where all classes of synthetic inputs have been replaced in an organic system; and gradual withdrawal of all classes of inputs over the three-year period until an organic system is in place by the third year (Table1).

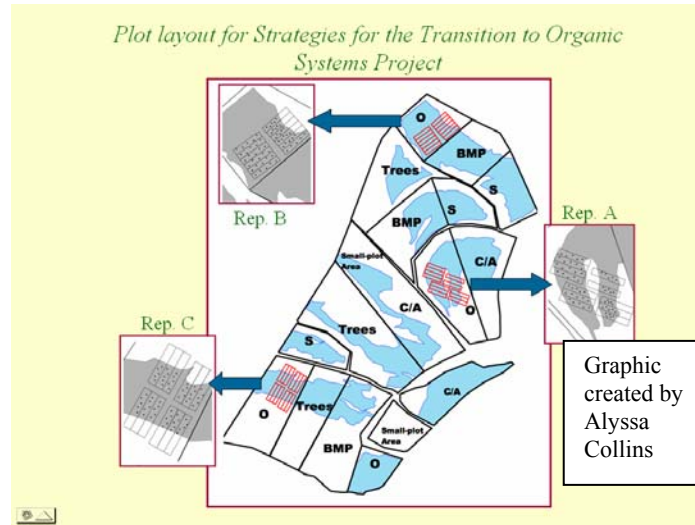
Table 1

Strategy-Treatments	YEAR 1	YEAR 2	YEAR 3
1 - Conventional	(+ F + H +P)	(+ F + H + P)	(+F +H + P)
2 - Organic	(- F - H - P)	(- F - H - P)	(- F - H - P)
3 – Organic Fert	(- F + H + P)	(- F + H + P)	(- F - H - P)
4 – Organic Weed	(+ F - H + P)	(+ F - H + P)	(- F - H - P)
5 – Organic Pest	(+ F +H - P)	(+ F+ H - P)	(- F -H -P)
6 - Gradual Trans	(Grad reduc.)	(Grad reduc.)	(- F - H - P)

²Notation used for treatment identification: [synthetic F (fertilizer), H (herbicide), P (pesticides including insecticides and fungicides)]; - (without), + (with). Grad reduc. (gradual reduction of all synthetic inputs, for example, banding vs. broadcasting. In the second year, only rescue chemical treatments were applied).

The experiment had two ‘starts’ of the following rotation to insure replication in time: soybean, sweetpotato, wheat/cabbage. Start 1 began in 2000 and Start 2 in 2001. A wide range of parameters were measured, including: aboveground biomass of cover crop and cash crop, soil quality indices (physical, chemical, biological), plant residue decomposition, soil microbiological properties, insects, weeds, disease, crop yield, and economics.

Soils were intensively mapped in 1996 based on soil type and drainage. Blocks were designated based on similar “diagnostic” soil types assigned within each block of five systems. Diagnostic soil series within the three blocks included Tarboro loamy sand (block A) and Wickham sandy loam and State loam (blocks B and C). All intensive sampling and measurements are made within these diagnostic soil units (Figure 1). Five, permanent, geo-referenced sampling points were designated within the diagnostic soil of each sub-plot in each block and system. These points were selected through a random numbers table representing number of meters perpendicular to transect(s) located in the diagnostic soil portion of each sub-plot .



The context of this research is an 81 ha long-term farming systems experiment established in 1998 at The Center for Environmental Farming Systems. The design is a randomized complete block consisting of three replications of five systems (Fig. 1.) Approximately 81 ha have been divided, based on intensive soil mapping, into 3 diverse agriculture production systems, a successional ecosystem and a plantation forestry system. Individual plots range in size from 0.81 to 4.1 ha. Blocking was done by soil type, such that all samples in a system were taken from the same diagnostic soil in a given replication. The agricultural production systems include a conventional system using all the best management practices currently used by farmers (BMP), an integrated crop/animal system, and an organic system. The BMP system is split into till and no-till subplots and the Crop Animal is divided into three subplots each representing a different entry point in a 15-year rotation. Implementation of the experiment has been achieved through careful coordination and planning on the part of all researchers, graduate students, and field crew.