

# ORG Project Details

Award Year 2002

6 Research Projects

---

## PROJECT INDEX

1. [Identification and Characterization of Potato Clones for Organic Production Systems](#) Grant No: 2002-51106-01936
2. [Various Strategies to Achieve Ecological and Economic Goals in the Transition Phase of Eastern Washington Organic Dryland Grain Production](#) Grant No: 2002-51106-01932
3. [Paths of Transition: Strategies for Peri-urban Organic Farmers](#) Grant No: 2002-51106-01935
4. [Integrated Weed and Soil Management Options for Organic Cropping Systems in Minnesota](#) Grant No: 2002-51106-01921
5. [Organic Poultry Production](#) Grant No: 2002-51106-01925
6. [Organic Nursery Production: Development and Demonstration](#) Grant No: 2002-51106-01949

# Identification and Characterization of Potato Clones for Organic Production Systems

<b>Accession No.</b>	0192741
<b>Subfile</b>	CRIS\
<b>Project No.</b>	WIS04640
<b>Agency</b>	NIFA WIS
<b>Project Type</b>	OTHER GRANTS
<b>Project Status</b>	TERMINATED
<b>Contract / Grant No.</b>	2002-51106-01936
<b>Proposal No.</b>	2002-03799
<b>Start Date</b>	01 AUG 2002
<b>Term Date</b>	31 JUL 2005
<b>Fiscal Year</b>	2005
<b>Grant Amount</b>	\$140,444
<b>Grant Year</b>	2002
<b>Investigator(s)</b>	Rouse, D.; Jansky, S.
<b>Performing Institution</b>	PLANT PATHOLOGY, UNIV OF WISCONSIN, MADISON, WISCONSIN 53706

## NON-TECHNICAL SUMMARY

Small organic farmers lack information on potato cultivars that have desirable traits for their farming systems such as the ability to respond to slow release of soil nitrogen. Modern cultivars have been selected under optimal conditions of chemical fertilizers and pesticides. Identify from the vast number of traditional and heirloom potato cultivars those that have superior performance in organic agricultural systems and that have market potential.

## OBJECTIVES

I. Identify potato clones that exhibit qualities for organic production systems. II. Identify potato clones that exhibit qualities for niche market production systems. III. Evaluate these clones for adaptability in various production systems and market systems. IV. Educate growers and marketers about improved characteristics.

## APPROACH

Four locations will be established for the purposes of screening a large number of cultivar/selections of potato for multiple performance criteria. One of these locations will be used primarily as a location to increase and store seed for all locations. Two sites will be on existing organic farms widely different in geography and environment. These two sites are the central core of our proposal. The fourth site will not be an organic site and will be used to evaluate specific mechanisms of resistance to disease and pests, and nitrogen response under controlled conditions for the purpose of confirming observations made on the organic farms. The first year of the study will be devoted to an initial evaluation and seed increase of approximately 200 cultivars and advanced breeding clones. These cultivars will not be mainstream cultivars except for the inclusion of a few widely grown cultivars for comparison purposes. Instead, they will be varieties currently being marketed for and grown in organic and niche market systems, heirloom varieties, and other minor varieties reported to have qualities such as broad-based disease and pest resistance, high yield, and exceptional flavor. Tubers for each of the 200 clones will be obtained

from certified seed agencies, breeders' collections, private seed companies, and state and Federal breeding programs. Approximately 10 pounds of each cultivar will be required for planting in the first year. Selected clones that are not available virus-free in clone banks or certification agencies will be introduced into tissue culture, virus-indexed, and freed of existing viruses with the aid of the Wisconsin State Seed Potato Program which has excellent facilities on the UW-Madison campus. In the second and third years of the project we will do a wide variety of evaluations. Most of these evaluations require only careful and timely observation with appropriate record keeping. A few of the evaluations require rudimentary facilities for tasks such as evaluating internal defects and tuber condition following storage, or for cooking quality of the material. Information will be disseminated through organic farming conferences, popular alternative agriculture magazines and journals, and by electronic means (internet).

## PROGRESS

2002/08 TO 2005/07 Three hundred to five hundred clones and varieties of potatoes were grown at each of two locations over three years to evaluate whether heirloom cultivars had advantages over modern cultivars in organic production systems. Both locations each year were certified organic farms where potatoes were being grown for the commercial organic market. Fertility regimes at each location were similar in that legume plow down was relied upon to supply nitrogen. In addition, nitrogen was added in the form of manure and organic nitrate fertilizer at one site but not the other. This other site was on a sandy soil and had overhead irrigation. Three 10 hill replicates of each variety were grown at each site each year. Not all cultivars were replicated across all years or sites. Yields were surprisingly high at the irrigated site. Yields of the best varieties were in excess of 300 cwt per acre of A size and quality each year under irrigation. Yields at the other site were lower with the best cultivars in excess of 200 cwt per acre. The best red skin varieties included Chieftain, Alaska Red, NY129 and Colorado Rose. The best yellow flesh varieties included Satina, Saginaw Gold, and Mrs. Meohler's Yellow. The best white potatoes included CF7523-1 and Nipigon with many other white varieties not far behind in yield. Among specialty varieties, the red fingerling Pap Casho yielded very high with remarkably long finger like tubers. The new blue flesh variety Adirondack Blue had high yields when compared with the standard All Blue variety and others like it. Of the heirloom varieties there were several with very high yields on a total weight basis. However, the tuber quality was such that these varieties had a high number of pickouts. Examples include Green Mountain which had a high amount of scab. Irish Cobbler and Early Ohio had scab, deep eyes and irregular tuber shape. It may be that yield was a more important factor in the past while tuber appearance was less important. In addition to yield and tuber quality data, insect pest and disease data were also collected during each season. Colorado beetle pressure was strong at each location and control measures included mechanical removal and the use of the insecticide Entrust. Amount of damage from beetles varied by cultivar suggesting differences in attractiveness of varieties to beetles. A web site has been established at [plantpath.wisc.edu/organicpotatoresearch](http://plantpath.wisc.edu/organicpotatoresearch).

2004/01/01 TO 2004/12/31 This project aims to test the hypothesis that among heirloom potatoes there are varieties that perform as well as or better than modern varieties in organic agricultural settings. This is because modern varieties have been bred under optimal conventional agricultural conditions that differ significantly from organic systems that do not use synthetic chemical inputs. We screened approximately 330 varieties of potato, including heirlooms that date to the 1800s, on two certified organic farms. These farms differed significantly in production practices primarily due to soil differences. One farm on light sandy soil used irrigation and the other farm on heavy prairie soil did not irrigate. The cultivars were replicated randomly three times as 10 hill plots at each location. We assessed maturity, beetle attractiveness and damage, yield, tuber size quality, specific gravity, scab and other external defects for each plot. Among the best performing varieties were a number of heirlooms in the round white category. For example, Green Mountain did well. In addition a number of varieties from the 1960s and 1970s were near the top yield. Russet skinned potatoes did not perform as well as round white varieties. Several red skin varieties such as Chieftain and Reddale had high yields. In the final year of the project we intend to assess response to nitrogen fertility and also assess disease pressure on selected varieties.

2003/01/01 TO 2003/12/31 Seed potatoes were obtained from several sources, including state seed certification agencies (AK, NY, WI), public potato breeding programs, private breeding programs, seed companies, Federal programs (IR-1 and Beltsville) and Seed Savers. All together 469 varieties of potatoes were obtained. For many of these, enough seed was available to establish three replicated plots of 3 meters on two production organic farms (Baraboo and Rosholt). A number of the varieties were increased from tissue culture plantlets and planted as transplants at the Rosholt farm. Plots were maintained through the growing season by hand weeding and hand removal of Colorado Potato Beetles. Data on cultivar maturity and degree of damage from insects were recorded during the season. At harvest the plots were dug with a one row digger and potatoes were picked up by hand. Potatoes were stored until weighed and graded. Potatoes were graded by washing and separating tubers

with external defects. Tubers were also separated by size into two groups; under or over two inch diameter. Yields ranged from zero to 24 pounds per plot, equivalent to 320 hundred weight per acre (35.8 tons/ha). Many cultivars produced 100 hundred weight per acre (11 tons/ha). Many of these cultivars were heirlooms, although a number of the breeding lines did equally as well. Percent A size potatoes was as high as 80% in some varieties. While the best heirloom varieties equaled or exceeded the modern cultivars and breeding lines, it was clear that quality was lower due to deep eyes, scab and/or misshapen tubers. As an example, the variety Green Mountain yielded 250 hundred weight per acre and had very high levels of scab reducing the marketable yield to 20-30 hundred weight per acre.

2002/01/01 TO 2002/12/31 This project has just started this fall and we have not collected any data nor do we have any results. At this time we are accumulating potato varieties for the trials we have planned this summer at two locations on organic farms. It appears we will have approximately 400 potato varieties in the trial this summer including several hundred potato varieties that are more than 50 years old.

## IMPACT

2002/08 TO 2005/07 We have demonstrated the potential for organic potato production to almost match conventional yields. Some heirloom varieties were identified that have potential for organic farmers. Many of the older varieties that yielded well had problems with tuber surface defects like scab that will need to be managed for successful production. These results should lead to increased organic potato production. \*\*PUBLICATIONS (not previously reported):\*\* 2002/08 TO 2005/07 No publications reported this period

2004/01/01 TO 2004/12/31 The data we have collected to date suggests there are a number of heirloom and modern varieties with high yield potential under organic practices. This gives farmers a wider selection of cultivars to choose from. We obtained yields with some varieties that were much higher than normally associated with organic production and were within 20% of average conventional yields. The impact should include increased productivity and reduced consumer prices for organic potatoes in the future.

2003/01/01 TO 2003/12/31 The data we have collected to date suggests there are a number of heirloom and modern varieties with high yield potential under organic practices. This gives farmers a wider selection of cultivars to choose from. We obtained yields with some varieties that were much higher than normally associated with organic production and were within 20% of average conventional yields. The impact should include increased productivity and reduced consumer prices for organic potatoes in the future.

2002/01/01 TO 2002/12/31 We expect to identify potato varieties with useful traits for alternative farming systems, especially organic farming systems. Useful traits include drought tolerance, disease resistance, adequate yield and quality in low fertility settings, insect tolerance, and marketing characteristics.

## PUBLICATIONS

2004/01/01 TO 2004/12/31 No publications reported this period

2003/01/01 TO 2003/12/31 No publications reported this period

2002/01/01 TO 2002/12/31 No publications reported this period

[↑ Return to Index](#)

# Various Strategies to Achieve Ecological and Economic Goals in the Transition Phase of Eastern Washington Organic Dryland Grain Production

---

<b>Accession No.</b>	0192845
<b>Subfile</b>	CRIS\
<b>Project No.</b>	WNP03422
<b>Agency</b>	NIFA WN.P
<b>Project Type</b>	OTHER GRANTS
<b>Project Status</b>	TERMINATED
<b>Contract / Grant No.</b>	2002-51106-01932
<b>Proposal No.</b>	2002-03805
<b>Start Date</b>	15 AUG 2002
<b>Term Date</b>	14 AUG 2006
<b>Fiscal Year</b>	2005
<b>Grant Amount</b>	\$164,701
<b>Grant Year</b>	2002
<b>Investigator(s)</b>	Gallagher, R. S.; Bezdicek, D.; Hinman, H.
<b>Performing Institution</b>	CROP & SOIL SCIENCES, WASHINGTON STATE UNIVERSITY, PULLMAN, WASHINGTON 99164

## NON-TECHNICAL SUMMARY

The organic transition phase is a three-year period when a cropping system must be free of non-approved inputs commonly used in conventional agriculture. During this period, farmers are extremely vulnerable to economic losses due to pests, inadequate fertility, and poor crop quality. These difficulties are compounded by the necessity to build biologically robust soils. This research will develop strategies that ease the economic burden of the organic transition period and achieve the necessary biological/ecological goals associated with soil and pest management.

## OBJECTIVES

1. Determine the optimal cropping system to reduce weed seed bank populations over a 3 year organic transition period.
2. Determine the relationship between soil quality and crop tolerance to weed competition.
3. Determine the optimal cropping system to enhance soil quality (i.e. nitrogen fertility, active soil organic matter, and soil structure) over a 3 year organic transition period.
4. Determine the relationship among soil quality, crop yield, and grain quality.
5. Determine economic consequences of profit-maximizing versus soil quality-maximizing approaches to the organic transition period and subsequent certified organic production.

## APPROACH

Nine crop rotations have been designed specifically for the three year transition period to certified organic grain production in eastern Washington. These rotations will include combinations of cash grains, perennial and annual forages, and legume, brassica, and grass green manure crops. The specific components of the crop rotations will

depend on the goal of the system with respect to short-term profitability during the transition period, the long-term enhancement of soil quality and pest management, and the post-transition profitability. In the fourth and fifth year of the study, all plots will be planted to indicator crops of spring and winter wheat, respectively. Grain yields and quality parameters will be measured.

## PROGRESS

2002/08 TO 2006/08 The data from this project has proven to be very interesting and should greatly facilitate the design of organic transition cropping system for the Palouse and similar regions. In summary, we have found that spring pea harvested for grain to be weakly competitive with weeds, prone to insect pests and diseases, and add little in the way of N to the soil for subsequent crops. In contrast, winter pea grown for green manure has been very vigorous, largely out-competing perennial and spring annual weeds, and producing large quantities of N-rich biomass resulting in a detectable increase in inorganic N pools. Earthworm populations (sampled April 2006) directly correspond to the amount of legume N returned to the soil during the transition years. Winter wheat has been more productive than spring wheat, but neither crop does well if soil N is not augmented with a legume green manure crop. The alfalfa-clover-oat-pea forage treatment has produced a harvestable product while making a respectable contribution to the soil fertility as indicated by inorganic soil N measurements. The reduced surface tillage approach which relies primarily on the rotary harrow for pre-plant weed control and the rotary hoe for in-crop weed control has worked well to control annual weeds when weed seed bank populations are modest and has helped retain crop residues on the surface to help with soil conservation. Residues from legume crops, however, do not provide season-long soil coverage due to their rapid decay. In year 4 after the transition phase of the project, all plots were planted to spring wheat. Spring wheat yield ranged from 55 to 65 bu per acre in the forage and green manure-intensive transition systems. These same systems also tended to have fewer weeds (primarily wild oats) than the other systems. Funding will be sought to continue this project for an addition four years. Manuscripts are currently being prepared that outline our findings with respect to the agronomic, soil fertility and biology, and economic aspects of the transition systems and the effects of these system on organic spring and winter wheat production.

2005/01/01 TO 2005/12/31 This was year 3 of a 5 year experiment. All crops and field operations were established and conducted successfully according to our proposed plan. We had excellent establishment of winter peas for our 2005 green manure treatments. All of the plant and soil samples from 2003-2005 have been processed, and preliminary data analysis has been conducted. This project was featured in our 3rd annual Organic Dryland Grain Production Field Day on June 15, 2005.

2004/01/01 TO 2004/12/31 This was year 2 of a 5 year experiment. All crops and field operations were established and conducted successfully according to our proposed plan. We had excellent establishment of winter peas for our 2005 green manure treatments. All of the plant and soil samples from 2003 have been processed, but some this data still needs to be analyzed. Plant and soil samples from 2004 are currently being processed. This project was featured in our Organic Dryland Grain Production Field Day.

2003/01/01 TO 2003/12/31 Experiments have been completed on the photobiology of annual and Italian ryegrass. These data show that phytochrome plays a clear role in the inhibition of dormancy release as well as the induction and inhibition of germination. This information suggests that ryegrass seed banks can be depleted through selective shallow tillage operations, thus reducing the impact of this weed. In addition, experiments are underway which are evaluating how the level and the timing of nitrogen fertility influence the competitive balance between annual grass weeds. These experiments will enable us to better optimize the competitiveness of spring wheat with respect to soil fertility management.

2002/01/01 TO 2002/12/31 A study site was located on the farm of Mr. Lester Boyd of Pullman. Fifteen acres has been acquired, and the experiment beginning in the spring of 2002 has been laid out with the help of the collaboration students from Pullman High School, under the supervision of Ms. Tina DeVault. Ms. Lori Hoagland has accepted the GRA position with the project and will begin to pursue her PhD. in the Spring of 2002.

2002/01/01 TO 2002/12/31 A study site was located on the farm of Mr. Lester Boyd of Pullman. Fifteen acres has been acquired, and the experiment beginning in the spring of 2002 has been laid out with the help of the collaboration students from Pullman High School, under the supervision of Ms. Tina DeVault. Ms. Lori Hoagland has accepted the GRA position with the project and will begin to pursue her PhD. in the Spring of 2002.

## **IMPACT**

2002/08 TO 2006/08 : The greatest impact from this research has been the increased awareness among growers and researchers that direct-seed, organic grain production in the Palouse region appears to be quite feasible. Grower interest and correspondence with our research team continues to increase. We anticipate that this increased dialog among growers, researchers and extension personnel will result in the development and extension of innovative crop production practices for the Palouse region. **\*\*PUBLICATIONS (not previously reported):\*\*** 2002/08 TO 2006/08 No publications reported this period

2005/01/01 TO 2005/12/31 : The greatest impact from this research has been the increased awareness among growers and researchers that direct-seed, organic grain production in the Palouse region appears to be quite feasible. Grower interest and correspondence with our research team continues to increase. We anticipate that this increased dialog among growers, researchers and extension personnel will result in the development and extension of innovative crop production practices for the Palouse region.

2004/01/01 TO 2004/12/31 The greatest impact from this research has been the increased awareness among growers and researchers that direct-seed, organic grain production in the Palouse region appears to be quite feasible. Grower interest and correspondence with our research team has increased substantially in 2004 compared with 2003. We anticipate that this increased dialog among growers, researchers and extension personnel will result in the development and extension of innovative crop production practices for the Palouse region.

2003/01/01 TO 2003/12/31 The data from the photobiology and weed competition experiments described in section 85. of this Progress Report have led to the development of experimental cultural and mechanical weed management strategies that have the potential to deplete soil weed seed bank, mechanically control weeds in conservation tillage, and reduce soil-borne disease pressure. We expect that these cultural and mechanical weed control strategies will reduce the cost and environmental impact of weed management in dryland grain production in eastern Washington.

2002/01/01 TO 2002/12/31 This research will reveal alternative strategies for transitioning to organic cereal grain production in the Palouse.

2002/01/01 TO 2002/12/31 This research will reveal alternative strategies for transitioning to organic cereal grain production in the Palouse.

## **PUBLICATIONS**

2005/01/01 TO 2005/12/31 No publications reported this period

2004/01/01 TO 2004/12/31 No publications reported this period

2003/01/01 TO 2003/12/31 No publications reported this period

2002/01/01 TO 2002/12/31 No publications reported this period

2002/01/01 TO 2002/12/31 No publications reported this period

[↑ Return to Index](#)

## Paths of Transition: Strategies for Peri-urban Organic Farmers

<b>Accession No.</b>	0192932
<b>Subfile</b>	CRIS\
<b>Project No.</b>	OHO00917-SS
<b>Agency</b>	NIFA OHO
<b>Project Type</b>	OTHER GRANTS
<b>Project Status</b>	TERMINATED
<b>Contract / Grant No.</b>	2002-51106-01935
<b>Proposal No.</b>	2002-03798
<b>Start Date</b>	01 AUG 2002
<b>Term Date</b>	31 JUL 2007
<b>Fiscal Year</b>	2007
<b>Grant Amount</b>	\$398,447
<b>Grant Year</b>	2002
<b>Investigator(s)</b>	Kleinhenz, M. D.; MCSPADDEN, B. G.; CARDINA, J.; MILLER, S. A.; BATTE, M.; GREWAL, P.; STINNER, D.
<b>Performing Institution</b>	HORTICULTURE AND CROP SCIENCE, OHIO STATE UNIVERSITY, 1680 MADISON AVENUE

### NON-TECHNICAL SUMMARY

Many organic farmers find it increasingly difficult to meet the challenges of profitability and environmental stewardship when transitioning to organic production. We will identify management practices that improve these challenges.

### OBJECTIVES

Document the economic and biological impacts of eight different transition strategies leading to organic vegetable production. Characterize the relationships among key agroecosystem variables and the strategies employed for transition on newly-certified organic vegetable farms. Assist farmers in peri-urban areas in selecting successful strategies for transition to organic vegetable production.

### APPROACH

We will evaluate cropping options from low-intensity to high-intensity management for their potential to meet nutrient needs of high value but fertility-sensitive vegetable crops during and after transition. The economic performance of the farm during transition will also be investigated using estimation of private economic net returns for transitional and conventional farm production. We propose to evaluate the end-point of those transitional strategies in order to evaluate their relative cost-effectiveness in terms of economic returns and effects on soil health. We will need to contribute to a more effective balance between these two elements of progress by offering educational products and programs tailored to the specific needs of operators of transitional organic peri-urban farms.

## PROGRESS

2002/08 TO 2007/07 OUTPUTS: Organic transition involves many questions which research can address. We: 1) evaluated the impacts of eight transition strategies leading to organic vegetable production, 2) characterized relationships among agroecosystem variables and the strategies, and 3) assisted peri-urban farmers in selecting transition strategies. Overview of experimental and extension approach: A replicated factorial experiment at the OARDC using ground previously cropped to corn. Soil type a moderately well drained Wooster silt loam (Typic fragiudalf). Four primary transition strategy treatments, and two secondary treatments, arranged as split-plots with main plots replicated five times in a randomized complete block design. Main plots measuring 40 ft w x 50 ft l. The 4 x 2 strategies managed as a 3-year transition, and in YR 4 all subplots being cropped to tomato. The 2006 crop was certified-organic by OEFFA. Primary treatments: A) Clean Fallow. Tillage occurred every two weeks during May and June; thereafter tillage occurred when emerged weeds reached a height of 6-10 in but before seed was produced. A mixture of wheat, rye, timothy, brassica, and hairy vetch was sown in late August and incorporated the next spring. B) Mixed Species Hay. A crop of pea-cal (Austrian winter pea and triticale), undersown with a mixture of alfalfa, medium red clover, alsike clover, timothy, and common vetch established each March. In YR 4, hay plowed in. C) Low-Intensity Vegetables. These crops planted as early-, mid- and late-season crops: radish, potato, lettuce (YR 1), kale, green bean, turnip greens (YR 2), peas, edamame soybean, winter squash (YR 3), and radish, tomato (YR 4). A mixed small grain crop planted after final vegetable harvesting each fall. D) Intensive Vegetable Production under High Tunnels. Four high tunnels (21 ft x 48 ft), each representing a replicate, were constructed. The same crops were planted in the high tunnels in the early-, mid- and late portions of the spring-summer cropping seasons as were planted in the field production of Strategy C. Secondary treatments: Half of each main plot received no amendment; the other received an annual addition of composted dairy manure (7.5 T/A d.w.). Compost was incorporated in three summer additions in Strategy A, spread over the surface after hay harvests in Strategy B, and incorporated prior to the main summer crop in Strategies C and D. The same quantity of compost was incorporated prior to planting tomatoes in YR 4. Baseline data on soil status obtained in the fall preceding YR 1 followed by comprehensive evaluations completed during the first year of certified status (YR 4). Data collected during YRS 1-3 included: a) economic factors, b) crop growth and quality, c) weed-soil interactions, d) microbial (including nematode) communities, and e) disease levels. The time spent on all field-based, crop management activity was recorded to the 15-min interval over four years. Insights gained during research activities shared via field days and tours, grower and scientist conferences and workshops, trade and scientific publications, digital and other media products, and consultations. PARTICIPANTS: Drs. Marvin Batte (Economics), John Cardina (Weed Science), Parwinder Grewal (Nematology/Soil Status), Matt Kleinhenz (Horticulture/Integrated Production Systems), Brian McSpadden Gardener (Soil Microbiology), Sally Miller (Plant Pathology), and Deb Stinner (Soil Status). Dr. Kleinhenz acted as lead PI. Graduate students Maria-Soledad Benitez, Fulya Baysel-Gurel, Shabeg Briar. Lead technicians Sonia Walker, Michelle Young, Dave McCartney, Jhony Mera. Partnering organizations Ohio Ecological Food and Farming Association, Ohio Produce Growers and Marketers Association, Meister Media, Great American Publishing, and University-government-industry collaborations in a minimum of four other U.S. states and two countries aiding in information delivery. TARGET AUDIENCES: Farmers, University personnel, industry organization leaders, consultants, local-regional economic development professionals. PROJECT MODIFICATIONS: Not relevant to this project.

2006/01/01 TO 2006/12/31 Progress Report The year 2006 was the third of field experimentation in which data were collected to assess the impact of four main and two subsidiary transition strategies on soil, crop and economic variables. Outcomes during transition employing fallowing or production of a mixed-species hay or vegetables in open fields or high tunnels, all with or without the addition of composted dairy manure to the soil, are being recorded. Whereas different vegetables were planted each year in the field vegetable and high tunnel plots, tomato was planted as an indicator crop in plots of all strategies in 2006 to assess their cumulative effects. Preliminary analyses suggest that inputs and potential revenues and soil variables differ among main strategies (fallow, hay, field vegetable, high tunnel) and that the incorporation of compost into soil affects plant, crop, and soil variables. Project activities and preliminary findings have also been presented and discussed in technical and non-technical formats in extension programs (e.g., field days) and conferences and scientific and non-scientific articles.

2005/01/01 TO 2005/12/31 The year 2005 was the third of field experimentation in which data were collected to assess the impact of four main and two subsidiary transition strategies on soil, crop and economic variables. Outcomes during transition employing fallowing or production of a mixed-species hay or vegetables in open fields or high tunnels, all with or without the addition of composted dairy manure to the soil, are being recorded. Preliminary analyses suggest that inputs and potential revenues and soil variables differ among main strategies (fallow, hay, field vegetable, high tunnel) and that the incorporation of compost into soil affects plant, crop, and

soil variables. Project activities and preliminary findings have also been presented and discussed in technical and non-technical formats in extension programs (e.g., field days) and conferences and scientific and non-scientific articles. Grower recruitment for proposal Obj. #2 continues.

2004/01/01 TO 2004/12/31 The year 2004 was the second of field experimentation in which data were collected to assess the impact of four main and two subsidiary transition strategies on soil, crop and economic variables. Outcomes during transition employing fallowing or production of a mixed-species hay or vegetables in open fields or high tunnels, all with or without the addition of composted dairy manure to the soil, are being recorded. Preliminary analyses suggest that inputs and potential revenues and soil variables differ among main strategies (fallow, hay, field vegetable, high tunnel) and that the incorporation of compost into soil affects plant, crop, and soil variables. Project activities and preliminary findings have also been presented and discussed in technical and non-technical formats in extension programs (e.g., field days) and conferences and scientific and non-scientific articles. Grower recruitment for proposal Obj. #2 has been initiated.

2003/01/01 TO 2003/12/31 Project initiated 9/1/02. Accomplishments to-date include: 1) Construction of high tunnels. The four aluminum, wood and plastic structures measure 48 ft. x 21 ft and were sited and constructed by projects and OARDC personnel, using materials purchased from vendors in OH and VT and a template design provided by vendors and Pennsylvania State Univ. 2) Establishment of and data collection from proposal Obj. #1-related plots at study site. Obj. #1 seeks to compare four main strategies for the transition to organic vegetable production. Strategies vary in management intensity, required inputs, and potential gains. Comparing two soil management strategies within main plots brings the total treatment number to eight. In Spring 2003, plots were arranged in a modified split plot design, after consultation with the OARDC Senior Statistician and project P.I.s. Collection and analysis of Obj. #1-related data covering the breadth of seven disciplines is ongoing. 3) Hosting of tours associated with workshops and field days and delivery of related presentations. The project P.I. delivered three presentations to a total of approx. 75 participants in a conference in March, field day in August and workshop tour in December. The overall goals, methods and current outcomes of the project were described. Attendees were also invited to consider participating in the project. 4) Initiation of grower recruitment for proposal Obj. #2-related activities. Obj. #2 is designed to (a) compare transition strategy-effects on indicators of farm and soil health in replicated plots at the OARDC and on the farms of grower cooperators and (b) assist in the adoption of optimal transition strategies on commercial farms, in part through working with farmers to isolate and communicate key components of successful transition strategies. Activities described above apply to Obj. #2.

2002/01/01 TO 2002/12/31 Accomplishments since project initiation on 9/1/02 include: 1) purchase of materials and supplies required to construct high tunnels, 2) identification of field site for studies related to Objective #1, 3) initiation of high tunnel construction, and 4) initiation of recruitment of grower cooperators for work related to Objective #2. Accomplishments anticipated in upcoming year include: 1) complete high tunnel construction and background soil sampling and complete year #1-Objective #1 studies, 2) hire project technician, 3) establish a project grower advisory committee and hold two meetings, 4) identify potential grower cooperators for work related to Objective #2, and 5) complete initial phase of outreach activities through participation in the OSU Organic Food and Farming Education and Research (OFFER) Program field day and development of other educational products (e.g., newsletter articles).

## IMPACT

2002/08 TO 2007/07 Major findings and conclusions are summarized in the numerous scientific and extension/outreach publications and products developed during the project. These findings and conclusions include: 1. The fact that nearly all biological, chemical, physical and economic variables studied were significantly affected by transition strategy and soil compost application (+/-). 2. That soil and cropping conditions in high tunnels tend to differ significantly from those in open fields. 3. In practice, all four strategies can be employed simultaneously on different parcels of the same farm; however, high tunnel vegetable production is the most popular strategy, provided establishment costs can be overcome. 4. That the peri-urban organic grower community is diverse in background and experience, manages a wide range of on-farm circumstances and requires information in multiple formats. It also tends to be less familiar with Extension but highly interested in interfacing with it. 5. That interest in the insights gained is not limited to growers and others operating in peri-urban settings. 6. Projects such as this can prompt and facilitate the development and execution of new farmer training programs, especially for urban market-gardeners. For example, the highly successful, ongoing OSUE

Cuyahoga County Urban Market Gardener Training program (MGTP) has been enriched by the Organic Transitions project. The MGTP blends hands-on workshops with twelve weeks of classroom training. The program culminates with participants preparing a business plan and seed proposal. To date, the MGTP has more than 100 graduates, has helped establish 38 new market gardens on 30 sites totaling 7 acres (7 additional sites on 5A are in development) and been instrumental in increasing the availability of locally- and organically-produced vegetables in urban Ohio. Projects such as this can also be instrumental in training the next generation of scientists and educators and in expanding the scope and reach of existing faculty-led integrated programs. 7. That the outcomes of projects such as this are not completely evident until after the official termination date. The so-called OSU Peri-Urban project continues to be a point of reference for a wide range of growers, scientists and other professionals due, in part, to the durable lessons learned and the unique nature of the plots employed. Additional follow-up impact assessment is recommended. \*\*PUBLICATIONS (not previously reported):\*\* 2002/08 TO 2007/07 1. Briar, S.S., S.A. Miller, D. Stinner, M.D. Kleinhenz, and P.S. Grewal. 2011. Effect of organic transition strategies for peri-urban vegetable production on soil properties, nematode community and tomato yield. *Applied Soil Ecology* 47:84-91. 2. Baysal-Gurel, F., M-S. Benitez, M.D. Kleinhenz, S.A. Miller, and B.B. McSpadden Gardener. 2008. Field management effects on damping-off and early season vigor of crops in a transitional organic cropping system. *Phytopathology* 98(5):562-570. 3. Baysal, F., M. Benitez, M.D. Kleinhenz, S.A. Miller and B.B. McSpadden Gardener. 2008. Effects of farm organic transition on soilborne disease suppression. *Phytopathology* 98:562-570. 4. Benitez, M-S., F.B. Tustas, D. Rotenberg, M.D. Kleinhenz, J. Cardina, D. Stinner, S.A. Miller, and B.B. McSpadden Gardener. 2007. Multiple statistical approaches of community fingerprint data reveal bacterial populations associated with general disease suppression arising from the application of different organic field management strategies. *Soil Biology and Biochemistry* 39:2289-2301. 5. Baysal, F., B. McSpadden Gardener, J. Cardina, M.D. Kleinhenz and S.A. Miller. 2009. Effect of field management practices on disease development, soil chemistry and yield in organic tomatoes. *Proceedings of the 2nd International Symposium on Tomato Diseases: Kusadasi-Turkey, Acta Horticulturae* 808. 6. Benitez, M. and B.B. Gardener. 2009. Culture-independent association of fungal and oomycete populations with damping-off disease incidence in soils. *Phytopathology* 99(60):S10. 7. Baysal Gurel, F., Kleinhenz, M.D., J. Cardina, B.B. McSpadden Gardener, and S.A. Miller. 2008. Suppression of *Rhizoctonia solani* in soils under different transitional organic management practices. *Phytopathology* 98: S19-S20. 8. Kleinhenz, M.D., S.D. Walker, C.P. Herms and J. Cardina. 2008. Weed seedbanks and field emergence during transition to organic vegetable production. *Proceedings of the 2008 Annual Meeting of the Weed Science Society of America*. 9. Benitez, M.S. and B.B. McSpadden Gardener. 2007. Bacteria involved in general soilborne disease suppression arising from transitional organic farm management. *Phytopathology* 97(7):S9. 10. Kleinhenz, M.D., S. Walker, C.P. Herms and J. Cardina. 2007. Weed seedbanks and field emergence during transition to organic vegetable production. *Program and Abstracts, Annual Meeting of the Weed Science Society of America*. 4-7 February, 2008. Chicago, IL. 11. Kleinhenz, M.D., S.D. Walker and D. Stinner. 2007. Spring and fall-winter production of leafy vegetables in organically-managed high tunnels in Ohio: compost matters. *Program and Abstracts, 2007 Annual Amer. Soc. Hort. Sci. Conference*, 16-20 July, 2007, Scottsdale, AZ. *HortScience* 42(4):859. 12. Benitez, M., F. Baysal-Tustas, M.D. Kleinhenz, J. Cardina, P.S. Grewal, D.H. Stinner, S.A. Miller and B.B. McSpadden Gardener. 2006. Effects of field management practice on rhizosphere microbial community structure. *Phytopathology* 96:S11-S12. 13. Baysal, F., B. McSpadden-Gardener, J. Cardina, M. Kleinhenz and S. Miller. 2007. Effect of field management practices on disease development, soil chemistry and yield in organic tomatoes. *Program and Abstracts, Second International Symposium on Tomato Diseases*. 8-12 October, 2007. Kusadasi-Turkey. 14. Baysal-Tustas, F., M. Benitez, A. Camp, M.D. Kleinhenz, J. Cardina, S.A. Miller, and B.B. McSpadden Gardener. 2006. Effects of different organic field management strategies on soil quality and soilborne diseases of vegetable crops. *Phytopathology* 96:S11a. 15. Kleinhenz, M. D., S. Walker, J. Cardina, M. Batte, P. Grewal, B. McSpadden Gardener, S. Miller and D. Stinner. 2005. Organic transition strategies for vegetable farms near urban areas. *Program and Abstracts, 2005 Annual American Society for Horticultural Science Conference*, 18-21 July, 2005, Las Vegas, NV. *HortScience* 40(4):1094. 16. Nahar, M. S., P. S. Grewal, S. A. Miller and D. Stinner. 2003. Effect of organic amendments on soil nematode community, microbial biomass and nutrient cycling. *Journal of Nematology* 35(3): 354-355. 17. Miller, S. A., F. Baysal-Tusta, B. McSpadden Gardener, J. Cardina and M. D. Kleinhenz. 2006. Effect of transition strategy and production system on disease development in organic tomatoes. *Proceedings of the 21st Annual Tomato Disease Workshop* pp. 38-40. 18. McSpadden Gardener, B.B., S.A. Miller, M.D. Kleinhenz, D. Doohan, and D.H. Stinner. 2005. Effects of organic nutrient amendments on populations of root colonizing fluorescent *Pseudomonads*. *Proceedings of the Organic Agriculture Consortium Conference: Transitioning to Organic Agriculture: Ecology, Economics and Marketing*, August 29-31, 2005, Wooster, OH. pp. 36-37. 19. Knebusch, K. 2005. High tunnels: how to grow, sell crops year-round. *Ohio State Agriculture*, Winter 2005-2006, p. 5. Also, at minimum, posted at the Ohio FarmBureau Federation website ([offb.org](http://offb.org); 9 Nov.) and reprinted in the *Madison Press* (11 Nov., p. 7A) and posted at the *Madison Press* website ([madison-press.com](http://madison-press.com)) 20. Knebusch, K. 2005. 27 October. High tunnels: how to grow, sell crops all year --even in Ohio -- and make a good go on small farm. *CFAES, OSUE, OARDC News and Media Relations*. 21.

Anonymous. 2005. Local, organic food popularity rising. Columbus CEO Magazine. Based on interview following news release regarding work within area of local regional food systems. 22. Hebert, K. 2005. High tunnel help: grow, sell your crops year-round. Farm and Dairy, 17 Nov. p. A22, A23 23. Freese, B., and Kleinhenz, M. D. 2008. Invited interview conducted and recorded 5 December, 2008 by radio writer J. Henke of Meredith Corporation (Des Moines, Iowa) whose products include Better Homes and Gardens, Successful Farming and other serials and Learfield Communications (Missouri). Recorded broadcast included "sound bites" from M. Kleinhenz and script from interview voiced by B. Freese, Editor of Living the Country Life. Piece included as a segment in a national radio program titled Living the Country Life broadcast by more than 170 radio stations throughout the U.S. on 26 January, 2009 and posted at [www.livingthecountrylife.com](http://www.livingthecountrylife.com). Subject was high tunnel production and season extension. 24. Reese, M. and M.D. Kleinhenz. 2008. Being last is best at farmers markets through season extension. Ohio Country Journal November 2008. (circulation 15,000). Also posted at Ohio Country Journal website (<http://www.ocj.com/R.11.html>). 25. Kleinhenz, M.D. and S. Mykrantz. 2004. Cultural and nutrient management in organic vegetable production. The Holmes Bargain Hunter. p. B1, B8. (29 March, 2004). Also printed in the Wooster Daily News. Provided technical information for article. 26. Kleinhenz, M.D. 2007. High tunnel production in Ohio: status, prospects and needs. Ohio Produce Growers and Marketers Association OPGMA Today. Fall 2007. p.2-4. 27. Huelsman, M.F. 2008. A Transition Guide to Certified Organic Crop Management. Organic Food and Farming Education and Research Program (OFFER) The Ohio State University Ohio Agriculture Research and Development Center, 74 pp. 28. Kleinhenz, M., B. Bergesford and R. Becker. 2007. Horticulture high tunnel workshop November 14, 2006. In: Ohio State Integrated Pest Management Grants Program Reports, 2005-2006. Ohio State University Integrated Pest Management Special Circular 199, J. Kovach and A. Sundermeier, eds. Ohio Agricultural Research and Development Center, in partnership with Ohio State University Extension, June 2007. pp. 77-84. 29. Myers, A. and M.D. Kleinhenz. 2006. Growers: high tunnels not just hype. Farm and Dairy, 23 Nov. p. A1, A3 (circulation 83,500). Also posted at Farm and Dairy website. Graphics for articles provided and printed. 30. Espinoza, J.M. and M.D. Kleinhenz. 2008. Longer growing season Catch free high-tunnel video presentation Thursday, March 20. CFAES, OSUE, OARDC News and Media Relations. 1 p. 31. Knebusch, K.R. and M.D. Kleinhenz. 2008. Interest high in high tunnels: 101 teaches ABCs. OARDC Report. January/February 2008 vol. 19(1), p.3. Also, full-length related article posted at <http://www.ag.ohio-state.edu/~news/story.php?id=4386>. 32. Sundermeier, A. P., and M. D. Kleinhenz. 2008. Introduction to hoophouses and high tunnels. In: Hoophouses and High Tunnels, North Central Region Organic and Sustainable Agriculture Video Series 2008. Live interactive broadcast held March 20, 2008 taped and archived at <http://tristateorganic.info/>. 33. Knebusch, K. 6 March, 2007. Local food, season extension: see how they're linked March 13. CFAES, OSUE, OARDC News and Media Relations. 34. Knebusch, K. 12 January, 2007. Monday (January 15) Congress workshop to focus on fruit, veggie season extension. CFAES, OSUE, OARDC News and Media Relations. 1 p. 35. Kleinhenz, M. D. Growth, development, and utilization of cultivated plants. Hartmanns Plant Science. 4th ed. Edited by: M. J. McMahon, A. M. Kofranek, and V. E. Rubatzky . Upper Saddle River: Prentice Hall. 2006. Condensed three chapters into one chapter and added sections on vegetable cropping systems management, including through use of organic methods. 36. Kleinhenz, et al. 2012. Various titles. Study results have also been disseminated via presentation delivered in person and by radio and webinar. During 2002-2012, a total of 140 presentations have been delivered in three countries (U.S., Canada, Kenya) and five U.S. states (OH, PA, NY, MO, IL). Through them, at least six thousand people have been reached directly with an unknown number reached by radio and webinar and re-viewing of webinar files and documents available via websites. Direct contact via in-person presentations exceeded 6,500 client contact-hours.

2006/01/01 TO 2006/12/31 Impact Activities have resulted in progress toward achieving the project goals outlined in the non-technical abstract of the project. These goals include increasing the ability of farmers to overcome the challenges associated with the transition to organic production and the understanding of the mechanisms underlying the relative success of various transition strategies. Variation among transition strategies in economic, biological and other indicators of potential strategy success is evident in preliminary data analysis. Similar analysis also points to variation in labor costs and biological productivity as a potential mechanism underlying the relative benefits and drawbacks of various transition strategies.

2005/01/01 TO 2005/12/31 These activities will improve the ability of farmers to overcome the challenges associated with the transition to organic production and the understanding of the mechanisms underlying the relative success of various transition strategies. Variation among transition strategies in economic, biological and other indicators of potential strategy success is evident in preliminary data analysis. Similar analysis also points to variation in labor costs and biological productivity as a potential mechanism underlying the relative benefits and drawbacks of various transition strategies.

2004/01/01 TO 2004/12/31 Activities have resulted in progress toward achieving the project goals outlined in the non-technical abstract of the project. These goals include increasing the ability of farmers to overcome the challenges associated with the transition to organic production and the understanding of the mechanisms underlying the relative success of various transition strategies. Variation among transition strategies in economic, biological and other indicators of potential strategy success is evident in preliminary data analysis. Similar analysis also points to variation in labor costs and biological productivity as a potential mechanism underlying the relative benefits and drawbacks of various transition strategies.

2003/01/01 TO 2003/12/31 Activities have resulted in progress toward achieving the project goals outlined in the non-technical abstract of the project. These goals include increasing the ability of farmers to overcome the challenges associated with the transition to organic production and the understanding of the mechanisms underlying the relative success of various transition strategies. Variation among transition strategies in economic, biological and other indicators of potential strategy success is evident in preliminary data analysis. Similar analysis also points to variation in labor costs and biological productivity as a potential mechanism underlying the relative benefits and drawbacks of various transition strategies.

2002/01/01 TO 2002/12/31 The potential impacts of this project include a greater ability of farmers to overcome the challenges associated with the transition to organic production. They also include a greater understanding of the mechanisms underlying the relative success of each strategy.

## **PUBLICATIONS**

2006/01/01 TO 2006/12/31 No publications reported this period

2005/01/01 TO 2005/12/31 No publications reported this period

2004/01/01 TO 2004/12/31 1. Hooker, N.H., M.T. Batte and J. Beaverson. "A Consumer Survey of Specialty Food Shoppers: Understanding of the National Organic Program and Willingness to Pay." AED Economics Report AEDE-RP-0044-04. Department of Agricultural, Environmental, and Development Economics, The Ohio State University, May, 2004. 2. Teratanavat, R.P., N.H. Hooker, M. Batte, J. Beaverson, and C.P. Haugtvad. 2004. Consumer Attitudes and Willingness to Pay for Processed Organic Food Products. Poster presented at AAEA annual meeting, Denver, CO. August 1-4. 3. Drew, J. 2004. Less is more when it comes to organic crops. Article developed by Associated Press writer J. Drew with input from M. Kleinhenz and others. Features SS917. Printed in September, 2004 issues of Canton Repository, Cleveland Plain Dealer, Columbus Dispatch, Wooster Daily Record and, possibly, other media publications. 4. Knebusch, K. 2004. OARDC study helps farms Near Cities Compare 8 ways to go organic (with veggies). OARDC Report Sept/Oct 2004 vol. 15 no. 5, p. 2.

2003/01/01 TO 2003/12/31 No publications reported this period

2002/01/01 TO 2002/12/31 No publications reported this period

[↑ Return to Index](#)

# Integrated Weed and Soil Management Options for Organic Cropping Systems in Minnesota

<b>Accession No.</b>	0192835
<b>Subfile</b>	CRIS\
<b>Project No.</b>	MIN-13-G07
<b>Agency</b>	NIFA MIN
<b>Project Type</b>	OTHER GRANTS
<b>Project Status</b>	TERMINATED
<b>Contract / Grant No.</b>	2002-51106-01921
<b>Proposal No.</b>	2002-03806
<b>Start Date</b>	01 AUG 2002
<b>Term Date</b>	01 MAY 2007
<b>Fiscal Year</b>	2007
<b>Grant Amount</b>	\$424,091
<b>Grant Year</b>	2002
<b>Investigator(s)</b>	Sheaffer, C. C.; Nickel, P.; Wyse, D. L.; Allan, D. L.
<b>Performing Institution</b>	AGRONOMY & PLANT GENETICS, UNIV OF MINNESOTA, ST PAUL, MINNESOTA 55108

## NON-TECHNICAL SUMMARY

Organic foods are the fastest growing segment in the U.S. food industry. Research is greatly needed on non-chemical weed control strategies and on soil fertility management to improve the efficiency of organic crop production. We will conduct research and education on integrated strategies for weed and soil management through the combined use of increased crop diversity, timed tillage, cultivation based on weed biology, and use of green and composted manures.

## OBJECTIVES

Improve economic and environmental sustainability of corn-soybean based organic cropping systems through decreased tillage, increased crop diversity, and increased quality of organic matter inputs. Develop crop diversity and timed tillage treatments that allow economically viable continuous cropping in fields infested with Canada thistle. Develop an education program to disseminate results of this project and to provide training on organic practices.

## APPROACH

Replicated field research will be conducted on the Elwell Agroecology Farm at Southwest Research and Outreach Center and on-farm. Biological data will be collected to allow for appropriate statistical and economical analysis. Specific experiments related to Objective 1 will: 1) Assess the effect of an integrated set of weed and soil management practices on weed incidence, soil quality, crop yield and quality, and profitability in established two and four-year organic rotation systems and 2) Test the effect of delayed planting, timed cultivation, interseeded cover crops, and composted manure on weed incidence, crop yield and quality in corn and soybean. For objective 2 we will: 1) Develop cropping systems and tillage sequences that are compatible with whole-field

management of Canada thistle on organically certified land, 2) Develop cover crop and tillage sequences that are compatible with site-specific management of Canada thistle patches on organically certified land, and 3) Determine the effect of tillage timing and sequence on Canada thistle. The education program (Objective 3) will build on the already strong and active Organic Conversion Project based at the University of Minnesota's Southwest Research and Outreach Center. Within this project, a farmer network has been the catalyst in developing teaching, mentoring, and experiential learning activities. The educational program will utilize expertise of producers, university faculty and staff, non-profit farming organizations and organic certifying organizations in disseminating the results of this project. The following are planned: 1) An annual summer field day held at the Elwell Agroecology Farm and on-farm, 2) Three traveling winter workshops at three locations/year, and 3) A field school for supporting agricultural professionals to develop their capacity for leadership in organic farming systems. Information/educational packets will be developed based on the results of on-farm and Elwell Farm research conducted in these experiments and previous research conducted by the Organic Conversion Project. Results from the research will also be posted on the Minnesota Organic Farmer Information Exchange website (<http://www.mofie.coafes.umn.edu>).

## PROGRESS

2002/08 TO 2007/05 Crop rotations are a key component of organic cropping systems. A four-year rotation of soybean, oat/alfalfa, alfalfa, and corn consistently resulted in higher corn grain yield and higher net return than a two-year rotation of soybean and corn. Soybean yield was similar for the two rotations. Increasing ground cover (hairy vetch cover crop), or adding organic matter via composted manure had no consistent effect on corn or soybean yields compared to control treatments of no cover crop and uncomposted manure. Hairy vetch was challenging to establish following harvest of corn in October. Giant foxtail and broadleaf weed populations were greater in corn grown in a two-year than a four-year rotation but were not affected by tillage, manure, or cover crop treatments. Broadleaf weed and foxtail populations in soybean were not affected by rotation or other treatments. Soil quality factors were affected by crop rotations. Total organic C and N were greater with the four-year rotation than for the two-year rotation because of the presence of alfalfa, a perennial crop, in the rotation. A hairy vetch cover crop and composted manure increased potentially mineralizable C, aggregate size, and Bray P compared to the no hairy vetch and uncomposted manure. Canada thistle is a problematic weed in organic cropping systems where synthetic herbicides cannot be used. Repeated tillage can reduce Canada thistle populations in organic cropping systems but tillage destroys soil organic matter and soil quality. Smother cropping with pearl millet, buckwheat, or a pea-buckwheat double crop suppressed Canada thistle populations by competing for resources but their effect was only temporary. Multiple harvests of alfalfa that is maintained for several years is effective in reducing Canada thistle root reserves and populations. Cover crops like winter rye and hairy vetch have potential to increase soil quality and reduce weeds if successfully established in corn. There were no consistent effects June, August, and October seeding dates on establishment of annual ryegrass-red clover and hairy vetch-winter rye cover crops in corn. Fall cover crop populations were influenced by the occurrence of precipitation following seeding and less by date. Only the August and October planting dates consistently resulted in significant winter and spring biomass. Spring biomass and ground cover were greater for the winter rye-hairy vetch mixture than for the annual ryegrass-red clover mixture. Cover crops had no effect on yield of a subsequent soybean crop. Winter rye provided suppression of broadleaf and grassy weeds. Hairy vetch is frequently used as a cover crop. Farmer landraces and marketed seed of hairy vetch were evaluated for winter cover and persistence. Locally produced landraces had the best persistence and fall cover. Some hairy vetch seed produced outside the Midwest failed to persist in Minnesota. Field research on organic production practices that is conducted on-farm and on university experiment stations can be used effectively to conduct educational events for farmers and consultants and to conduct training schools for professionals

2006/01/01 TO 2006/12/31 In long-term organic cropping system research, we continued to find that crop rotation had a significant affect on corn yields. A four-year rotation of soybean, oat/alfalfa, alfalfa, and corn averaged 20% higher corn yield than a two-year rotation of soybean and corn. Soybean yield was similar for the two rotations. Sowing of a hairy vetch cover crop, use of composted manure to add N, and spring tillage had no consistent effect on corn or soybean yields compared to a control treatment of no cover crop, heap manure, and fall tillage. Populations of giant foxtail, the predominant annual weed at the site, were greater in corn grown in a four year than a two year rotation but were not affected by tillage, manure or cover crop treatments. Foxtail populations in soybean were not affected by rotation, tillage, or manure treatments. Soil quality factors were affected by cropping system treatment effects. Total organic C and N were greater with the four year rotation than for the 2 year rotation but aggregate size and Bray P were greater with the two year than four year rotation. Using a hairy vetch cover crop and applying composted manure increased potentially mineralizable C, aggregate size, and Bray P compared to the control. For effective Canada thistle control in organic cropping systems, alfalfa should

be included in the rotation. Multiple harvests of alfalfa are effective in reducing Canada thistle root reserves and populations. In a rotation that includes only corn and soybean, thistle control via tillage is difficult. Repeated tillage in a fallow year or use of a pea-buckwheat double smother crop are approaches to partially suppress thistle. We evaluated the effect of date of seeding on establishment of cover crops. For annual ryegrass, red clover, and hairy vetch, August planting resulted in greater fall populations than planting in June or October. Winter rye populations were not affected by establishment date. Winter rye and hairy vetch provided greater coverage than annual ryegrass and red clover. Cover crops had no effect on yield of a subsequent soybean crop. Winter rye provided suppression of broadleaf and grassy weeds.

2005/01/01 TO 2005/12/31 Crop rotation is the most effective weed and soil fertility management tool available to organic farmers. We compared a two-year corn-soybean rotation with a four-year corn-soybean-oat-alfalfa rotation. Giant foxtail and broadleaf population and biomass were greater in corn in the two-year rotation than in the four-year rotation. Within each rotation, a winter rye cover crop after corn and a red clover/hairy vetch cover crop after soybean resulted in greater giant foxtail and broadleaf populations than when no cover crop was seeded following corn. Giant foxtail and broadleaf weed populations were affected by the interaction of crop rotation and cropping system so that the system effect was greater in the two-year rotation than the four-year rotation. Corn grain yield was greater in the four-year rotation compared to the two-year rotation. Corn yield was also greater when fertilized with heap (raw) manure and fall tilled than when grown with a winter rye cover crop. Soybean yield was not consistently affected by rotation or management system. Corn response to rotation and manure application was due to a greater dependence on nitrogen fertility input than soybean, a crop that has dinitrogen fixation potential. Fall cover crops can reduce soil erosion, increase weed seed predation, and upon incorporation the following spring increase soil biomass and nitrogen recruitment. Interseeding cover crops with corn during the growing season may permit cover crops to establish during the summer and resume growth once corn is removed. Winter rye establishment was best in October and least in June. Red clover establishment was greater in June than in October. Winter rye establishment was greater in June and October than in August. Establishment of hairy vetch was greater in October than in June or August. Winter rye was the greatest spring biomass producer among the cover crops. In contrast, red clover and ryegrass did not overwinter and produce spring biomass. Hairy vetch biomass production in the spring was dependent on winter conditions because it overwintered in only one of two years. Populations of weeds and yields in a following soybean crop were not consistently affected by cover crop treatments. Canada thistle is a problematic weed for certified organic producers who eschew systemic herbicides and must use multiple-year management strategies for its control. Repeated tillage from May through September was the most effective control for Canada thistle in organic systems. Growth of smother crops such as pea, buckwheat, millet, and sun hemp resulted in fewer Canada thistles relative to growth of corn with between row tillage. Systems that include smother crops such as a pea-buckwheat double crop and cultivated soybean production may allow simultaneous crop production and effective management of Canada thistle. Results generated from this research were used in educational activities and professional presentations. These included field schools, demonstrations, and field days.

2004/01/01 TO 2004/12/31 Annual ryegrass-red clover and winter rye-hairy vetch mixtures were interseeded into established corn in June, in August, and broadcast seeded after corn harvest. Corn received N fertilizer from compost or heap manure. For the winter rye-hairy vetch binary mixture, grass and legume populations averaged 117 and 336 plants/m<sup>2</sup>, respectively; and for the annual ryegrass-red clover binary mixture grass and legume populations averaged 642 and 238 plants/m<sup>2</sup>, respectively. Legume and grass populations two weeks following seeding were greater for the June than for the August seeding but survival of seedlings from both planting till fall was poor. Compost or heap manure amendments did not affect cover crop populations. Cover crop or fertility treatments had no effect on corn grain yields. We concluded that soil moisture was an important limiting variable affecting successful interseeding of cover crops into corn. Canada thistle is a noxious perennial weed that is particularly hard to control in organic production systems that cannot use herbicides. Use of buckwheat, pea, and pearl millet cover crops and continuous tillage resulted in November Canada thistle populations of 2.9, 1.8, 1.4, 0.4 plants m<sup>2</sup>. Suppression of Canada thistle by cover crops was greatly influenced by the density of cover provided by each species. Identification of a cover crop system that includes a marketable product would enhance profit for producers while providing weed control. In long-term organic production system research, grass and broadleaf weed populations were reduced in a four-year rotation including alfalfa compared to a two-year corn-soybean rotation. Including late summer and fall seeded winter rye or hairy vetch cover crops in rotations did not consistently affect weed populations or corn and soybean yields. Corn and soybean grown in a high purchased input system that utilizes herbicides had lower weed populations than corn or soybean grown in organic systems that depend on tillage for weed control. For a two-year corn and soybean rotation, high input corn grain yields averaged 7200 kg per ha while organically grown corn grain yields averaged 4200 kg per ha. For a four-year rotation that included alfalfa, corn grain yields averaged 6700 kg per ha while corn grain yields in

an organic system averaged 6500 kg per ha. Inclusion of cover crops did not increase corn yields in either the two- or four-year rotation.

2003/01/01 TO 2003/12/31 Annual ryegrass-red clover and winter rye grain-hairy vetch mixtures were interseeded into established corn at the last cultivation and in August and broadcast seeded after corn harvest. Timely rains following each seeding resulted in satisfactory initial populations of grasses and legumes of greater than 200 plants/m<sup>2</sup>, but subsequent drought conditions and the resulting dry soils greatly reduced these populations in to the fall to levels less than those achieved through a broadcast seeding after harvest. We concluded that soil moisture was an important limiting variable affecting successful interseeding of covers into annual crops. Canada thistle is a noxious perennial weed that if uncontrolled can have significant negative effects on crop yields. A long-term study was initiated at Lamberton and Madison for control of Canada thistle in organic production systems. Continuous tillage, beginning in June, resulted in greater thistle populations than continuous tillage beginning in May, or than spring-seeded buckwheat or oat cover crops. Suppression of Canada thistle by cover crops was greatly influenced by the density of cover provided by each species. In long-term organic production system research, the effectiveness of manure and legume green manure crops as suppliers of N was evaluated. Manure application to meet N needs of a corn crop has resulted in excessive levels of soil P thereby necessitating reduction in manure application rates. Hairy vetch that was interseeded into standing soybean was not effective in supplying N because of inadequate stands. Hairy vetch stands were reduced by excessive residue on the soil surface following crop harvest. Although hairy vetch has been used extensively as a cover crop, variability among ecotypes in winter survival and spring regrowth is unknown. There are no available varieties. Research was initiated to evaluate the diversity in yield and persistence of hairy vetch ecotypes that are grown throughout the region. Three major educational activities transferred information about organic production techniques to over 150 producers. Topics included cover cropping, weed control, and soil organic matter. A listening session was also held for over 30 producers and community members to provide input in the direction of organic research and education. Marketing and consumer education were identified as important areas needing attention. On-farm research was initiated to evaluate the effect of timing of winter rye grain suppression on weed suppression and yield of an interseeded soybean crop.

2002/01/01 TO 2002/12/31 To enhance the N and organic matter input into organic cropping systems as well as to provide ground cover, a mixture of annual legumes including hairy vetch and annual medic was successfully seeded into soybean at the last spring cultivation. Winter rye was seeded into corn. Populations of legumes and rye were about 7 and 12 plants/square meter. Factors identified as limiting establishment included surface soil moisture deficits and inadequate light due to crop canopies and crop residues. To provide N for growth of a subsequent corn crop, heap manure was fall applied at rates of 10 Mg/ha for 4-year rotations containing oat-alfalfa-corn-soybean and 20 Mg/ha for a 2-year corn-soybean rotation. Although both systems require N and organic matter from manure, there is concern regarding excessive buildup of P in the soil. About 100 students from across the USA attended a 3 day organic field school in organic farming systems that was held at the Elwell Agroecology Farm. Topics including composting of manure, cover cropping, soil health, and weed control.

## IMPACT

2002/08 TO 2007/05 This research was conducted at a long-term organic research site in a low rainfall region of Minnesota. It substantiates the biological and economic value of diversified crop rotations for sustainable organic crop production. Short duration rotations with only corn and soybean production are detrimental to soil health and be difficult in maintaining crop yields even with a cover crop. This should alert policy makers that inclusion of a perennial crop like alfalfa in organic crop rotations is critical for weed control and soil maintenance. The challenge for growers is how to achieve an economic return from alfalfa forage production. Many growers in southwestern Minnesota don't have animals to utilize harvested alfalfa. This research shows challenges of seeding cover crops in regions that lack summer and fall rainfall. Cover crop seeding may cause an economic loss if covers are not successfully established. It shows that seed of hairy vetch cover crops should be produced in the region of intended use. If not, hairy vetch may not over winter and be available for the following spring. It shows that smother crops like peas or millets provide short-term suppression of Canada thistle. Perennial crops that can be frequently harvested provide the best long term control. Learning groups of farmers, researchers, and educators have been developed to promote transfer of information about organic agriculture production practices. They meet periodically to facilitate discussion and exchange ideas. The learning groups will be a focal point in generating new organic agriculture research. \*\*PUBLICATIONS (not previously reported):\*\* 2002/08 TO 2007/05 Evans, E., P. Porter, E. Dyck, P. Nickel, C. Sheaffer, D. Wyse, D. Allan and M. harbor. 2003. An update on

organic research and outreach at the University of Minnesota's Southwest Research and Outreach Center. Agron. Abst. P. 3003.

2006/01/01 TO 2006/12/31 Organic food is the fastest growing sector of the retail market. This research provides new information to producers on practices to increase the efficiency of organic crop production that provides organic food.

2005/01/01 TO 2005/12/31 We have identified alternative approaches to control weeds, maintain environmental quality, and maintain crop yields in organic systems. Alternative approaches are essential for economic survival of organic farmers.

2004/01/01 TO 2004/12/31 This research provides information to producers on practices that are suitable in organic production systems. Since N fertilization using livestock and green manures, and weed control were determined to be important factors limiting production, these topics are the subject of research on-farm and on the Elwell Agroecology farm in southwestern Minnesota.

2003/01/01 TO 2003/12/31 This research provides information to producers on practices that are suitable in organic production systems. Since N fertilization using livestock and green manures, and weed control were determined to be important factors limiting production, these topics are the subject of research on-farm and on the Elwell Agroecology farm in southwestern Minnesota.

2002/01/01 TO 2002/12/31 Basic information provided on use of legume cover crops and manures in organic production systems will increase the efficiency and profitability of organic farmers and reduce the cost of organic foods. Education is critical in increasing the efficiency of organic production.

## **PUBLICATIONS**

2006/01/01 TO 2006/12/31 No publications reported this period

2005/01/01 TO 2005/12/31 Harbur, M.M., D.L. Wyse, C.C. Sheaffer and D.L. Allan. 2005. Canada thistle management in organic field crops. Proc. of the North Central Weed Science Society, December 12-16, 2005, Kansas City, MO.

2004/01/01 TO 2004/12/31 No publications reported this period

2003/01/01 TO 2003/12/31 1. Evans, E., Porter, P., Dyck, E., Nickel, P., Nickel, L., Sheaffer, C., Wyse, D. Allan, D., and Harbur, M. 2003. An update on organic research and outreach at the University of Minnesota Southwest Research and Outreach Center. Agron. Abst. p. 303. 2. Sheaffer, C.C., and Seguin, P. 2003. Forage legumes for sustainable cropping systems. p. 187-216. In A. Shrestha (ed). Cropping systems. Trends and Advances. The Haworth Press, Inc., Binghamton, NY.

2002/01/01 TO 2002/12/31 No publications reported this period

[↑ Return to Index](#)

# Organic Poultry Production

---

<b>Accession No.</b>	0192903
<b>Subfile</b>	CRIS\
<b>Project No.</b>	MIN-16-G09
<b>Agency</b>	NIFA MIN
<b>Project Type</b>	OTHER GRANTS
<b>Project Status</b>	TERMINATED
<b>Contract / Grant No.</b>	2002-51106-01925
<b>Proposal No.</b>	2002-03796
<b>Start Date</b>	01 SEP 2002
<b>Term Date</b>	31 AUG 2007
<b>Fiscal Year</b>	2007
<b>Grant Amount</b>	\$197,641
<b>Grant Year</b>	2002
<b>Investigator(s)</b>	Jacob, J. P.
<b>Performing Institution</b>	ANIMAL SCIENCE, UNIV OF MINNESOTA, ST PAUL, MINNESOTA 55108

## NON-TECHNICAL SUMMARY

Many 'family' farms are switching to organic crop production. In doing so, they are producing non-traditional crops. Organic poultry production, like organic crop production, is also on the increase but its expansion is limited by the availability of organic feeds. The purpose of this research is to develop a feeding strategy for organic poultry production using non-traditional crops grown in the area.

## OBJECTIVES

Many small farm holdings are switching to organic crop production. In doing so, they are producing crops not traditionally grown in the area. For many, a strong market is required for the economic sustainability of these crops. Organic poultry production is one possible market. Organic poultry production, like organic crop production, is also on the increase but its expansion is limited by the availability of organic feeds. The purpose of this research is to develop a feeding strategy for organic poultry production using non-traditional crops grown in the area. This would assist both the organic crop producer (developing a market for their crops) and the organic poultry producer (developing a feeding strategy that makes most economical use of the crops available).

## APPROACH

A database of the nutrient composition of organically grown feed ingredients will be established. Samples of organically grown feed ingredients will be collected from a variety of sources and analyzed for dry matter, crude protein and amino acid profile, ether extract and selected fatty acids, total and non-phytate phosphorus, calcium, fiber, and any known anti-nutritive factors. Based on nutrient composition, a variety of certified organic poultry feeds will be formulated and tested in battery brooder trials with broiler chicks. The diets will vary in the level of inclusion of different feed ingredients. The most promising diets will be tested in floor pen studies with broiler, pullet and laying hens. Based on the results of the floor pen studies, recommendations will be made for field-testing in larger-scale organic poultry operations.

## PROGRESS

2002/09 TO 2007/08 OUTPUTS: The research results have been presented at regional (Midwest Poultry Federation Convention) and national (Poultry Science Association annual meeting) poultry events. Poultry Science Association meeting, 2005. Overview of management practices of small flock owners in Minnesota. Midwest Poultry Federation Convention, Organic session, 2005. Alternative feedstuffs for organic poultry production. PARTICIPANTS: This research was funded by a USDA/CSREES grant. List of Collaborators: 1. Study: Nutrient content of organically grown feedstuffs - Various organic crop producers in the Midwest - Buckwheat growers association 2. Feeding trial: Use of high methionine corn in pullet and layer trials - Organic Valley: Provided the chicks and feed used in the trial - Michael Fields Agricultural Institute: Provided the high methionine corn used in the trial - Land'O Lakes: Mixed the feed used in the trial 3. Feeding trial: Use of Illinois Bundleflower in chick starter diets - Paul R. Peterson, Department of Agronomy and Plant Genetics: Provided the Bundleflower seed used in the trial 4. Feeding trials: Use of buckwheat in organic broiler diets / Use of alternative feed ingredients in organic broiler diets - Minnesota Buckwheat Growers Association 5. Feeding trial: Use of potato protein in organic broiler diets - ChemGen: Supplied the feed enzyme used in the trial TARGET AUDIENCES: - Organic crop and poultry producers in the Midwest - Nutritionists working with organic poultry producers

2006/01/01 TO 2006/12/31 The first phase of this project was the development of a database of the nutrient composition of organically grown feed ingredients. Organically grown corn, wheat, barley, oats, soybeans, field peas, buckwheat and flax seed samples were obtained from producers throughout the Midwest. The nutrient content of the organically grown feedstuffs were compared with published values for conventionally grown counterparts. The nutrient content of a given feedstuff will vary due to differences in climate, soil conditions, maturity, cultivar, management and processing factors. As an emerging industry, organic crop production practices vary considerably from farm to farm. As a result there is considerable variation in the nutrient content of organically grown feedstuffs. This will impact the formulation of organic livestock feeds and demonstrates the need to develop a more extensive database of the nutrient content of organically grown feedstuffs. The second phase of this project is the development of a feeding strategy for organic poultry production. The main problem that needs to be addressed with organic poultry diets is an alternative for synthetic methionine which will soon be prohibited in certified organic poultry diets. Casein and potato protein have the potential to replace synthetic methionine in poultry diets, but they are not currently available as certified organic. Feeding trials have been conducted with broilers and trials with pullets are planned for 2007. Organically raised poultry must have access to the outdoors 'with encouragement to use it.' We video-taped laying hens on pasture plots composed of different forage crops. The videos are currently be analyzed for hen preference for the crops offered. Forage samples from the same crops have been collected at different stages of development and are in the process of being freeze-dried for lab analyses. To date, 62 samples have been collected, with several more to be freeze-dried.

2005/01/01 TO 2005/12/31 The purpose of this research is to develop a feeding strategy for organic poultry production using non-traditional crops grown in the area. The main problem that needs to be addressed with organic poultry diets is an alternative for synthetic methionine which will soon be prohibited in certified organic poultry diets. The first phase of the project involved development of a database of the nutrient composition of organically grown feed ingredients. To date, almost 100 samples have been received and analyzed. True metabolizable Energy (TME), using both turkeys and chickens, were determined for several samples. The second phase of the project involved feeding trials with broilers. The first trial was in the summer of 2003 and looked at the use of potato protein as an alternative source of dietary protein. While the results indicated that potato protein is a good source of methionine for organic poultry diets, organic potato protein is not currently available. With a potential market now being identified it is hoped that entrepreneurs will come forward to develop a source. A second feeding trial in the summer of 2004 looked at the use of Bundleflower in poultry starter diets. Even at low levels, the inclusion of Bundleflower in broiler starter diets negatively affected feed consumption, growth and feed efficiency. Other researchers working with growing pigs have found that Bundleflower is a potential feed ingredient for older animals. This may be the case with poultry, but has not yet been investigated. A third trial in the Fall of 2005 looked at the use of casein in broiler grower diets, as an alternative source of methionine. The high lysine content of casein limited its potential inclusion to 7.5% of the diet. The results appear to indicate that the inclusion of casein is a potential solution to the methionine problem for organic poultry producers. As with potato protein, however, there are no organic sources of casein. Researchers at West Virginia University have indicated that when broilers are kept outdoors, pasture consumption is important in meeting the methionine requirement - although only for the older birds. Broiler starter diets still require supplemental with synthetic

methionine. There is very little research available on which crops are best for use with pasture poultry production. During the summer of 2005 a preliminary behavioral trial was conducted to determine which of 16 possible pasture crops (grasses and legumes) chickens prefer. The data is still being analyzed. In addition, samples of pasture crops were collected over different developmental stages. They are in the process of being freeze-dried for nutrient analyses. The results of these two studies will help in making crop recommendations to pasture poultry producers. Two more feeding trials are planned for Spring and Summer 2006.

2004/01/01 TO 2004/12/31 Many small farm holdings are switching to organic crop production. In doing so, they are producing crops not traditionally grown in the area. For many, a strong market is required for the economic sustainability of these crops. Organic poultry production is one possible market. The purpose of this research is to develop a feeding strategy for organic poultry production using these non-traditional crops. In Part 1 of the study, a database of the nutrient composition of organically grown feed ingredients will be established. Samples of organically grown feed ingredients will be collected from a variety of sources and analyzed for nutrient composition. Samples collected to date include: 1) 8 samples from the organic research fields at the SW ROC in Lamberton: Yellow corn, white corn, amaranth, wheat, buckwheat, buckwheat screenings and flax. True Metabolizable Determinations (TME) were determined for these feedstuffs, comparing turkey and chicken assays; 2) 72 samples have been collected from organic and transitional farms: 5 barley, 7 buckwheat, 7 corn, 8 peas, 5 flax, 4 flax millings, 5 oats, 2 hullless oats, 1 millet, 1 navy bean, 7 soybeans, 3 soybean meal, 1 sunflower seed meal, 3 rye, 1 triticale, 9 wheat, 1 weed seeds plus 1 oats + millet and 1 barley + peas; 3) 2 samples of potato protein, a good source of methionine which is an important amino acid in poultry diets; 4) 2 of Illinois Bundleflower; 5) 4 insect meals: 1 house fly larva, 1 house fly pupae, 1 face fly pupae and 1 mealworm. Considerable variability was found in the nutrient content of feedstuffs, especially the fat content of flax. Since flax is commonly added in organic poultry feeds to increase the omega-3 content of eggs or chicken meat, it is an important feed ingredient in organic poultry feeds. To further investigate this, flax samples from a study being conducted at the Southern Research and Outreach Center in Waseca. As part of the study, 61 flax samples were collected from different locations in a field - to evaluate the effect of landscape on flax yield and nutritional composition. These samples are being analyzed for crude protein, fat content, amino acid profile and fatty acid profile. In Part 2 of the study some of the feed ingredients were tested in feeding trials with broilers. A trial was conducted with potato protein. Potato protein is used in Europe to meet the methionine requirement of poultry without adding synthetic methionine (an ingredient not allowed in organic poultry diets). Potato protein can be successfully used in poultry diets without the need for synthetic methionine supplementation. However, an inclusion rate of 12% of potato protein was required to meet the nutritional requirements of the birds and such levels of a non-organic feedstuff is not allowed. In a similar study, Illinois Bundleflower, a crop native to the Midwest and being re-introduced in organic farms was included in broiler starter diets at 0, 5, 10 and 15%. Even at the lowest level of inclusion, bundleflower had a negative impact on growth of the chicks and thus is not recommended for starter diets. It may be possible to include bundleflower in the diets of older chicks.

2003/01/01 TO 2003/12/31 Many small farm holdings throughout the United States are switching to organic crop production. In doing so, they are producing crops not traditionally grown in the United States, such as buckwheat, sorghum, millet, rye, hullless oats, flax, and field peas. A strong market is required for the economic sustainability of many of these crops. Organic poultry production, like organic crop production, is also on the increase but its expansion is limited by the availability of certified organic feeds. Organic poultry production, therefore, is a logical market for these non-traditional crops. The purpose of this research is to develop a feeding strategy for organic poultry production using non-traditional crops grown in the area. This would assist both the crop producers, by developing a market for their crops, and the organic poultry producers, by developing a feeding strategy that makes most economical use of the crops available. The main problem that needs to be addressed with organic poultry diets is an alternative for synthetic methionine which will soon be prohibited in certified organic poultry diets. It is necessary to identify alternative sources of dietary methionine. The first phase of the project involves development of a database on the nutrient composition of organically grown feed ingredients. This phase is currently underway and will continue throughout the study as new samples become available. To date, 47 samples have been received and analyzed. The second phase of the project involves feeding trials with broilers, pullets and laying hens. This phase started in the summer of 2003 with the first broiler trial. The data has been collected but is still being analyzed. Preliminary analyses, however, indicate potato protein may be a good source of methionine for organic poultry diets. The final phase of the study will involve field testing of the most promising organic poultry diets.

2002/01/01 TO 2002/12/31 The project only started September 1, 2002 so it is in the very early stages. We are currently collecting samples of feedstuffs for analysis.

## IMPACT

2002/09 TO 2007/08 Economic impact - The project is expected to impact rural families throughout the Midwest - those producing organically grown crops as well as those raising certified organic poultry. Locally grown organic feed would be cheaper than imported organic feed. In addition, producers growing some of the feedstuffs (e.g, buckwheat, field peas) could perhaps use them in their own organic poultry feed. Organic crop producers would save on transportation/marketing if they could sell it locally. Also, including these non-traditional ingredients in organic poultry feeds will give producers a market that they may not otherwise have. The number of organic poultry operations, and consequently profits, might increase if feed were more readily available. Currently, access to certified organic feeds limits the number of people able to raise organic poultry. Results of the analysis of the collected organically grown feed samples demonstrate that there are similarities in the average nutrient content of organic and conventional feedstuffs but organically grown feedstuffs can have wide variations in nutrient content which will impact the formulation of consistent organic livestock feeds. Environmental impact - Encouraging organic operations-poultry and crop-would be beneficial to the environment. Organic crop operations would decrease pesticide usage and reduce erosion. **\*\*PUBLICATIONS (not previously reported):\*\*** 2002/09 TO 2007/08 1. Nutrient Content of Organically Grown Feedstuffs. 2007. Journal of Applied Poultry Research 16: 642-651. 2. Jacob, J.P. 2007. Use of Illinois Bundle Flower in chick starter diets. Journal of Applied Poultry Research 16(1):39-44.

2006/01/01 TO 2006/12/31 Economic impact- The project is expected to impact rural families throughout the midwest - those producing organically grown crops as well as those raising certified organic poultry. Locally grown organic feed would be cheaper than imported organic feed. In addition, producers growing some of the feedstuffs (e.g, buckwheat, field peas) could perhaps use them in their own organic poultry feed. Organic crop producers would save on transportation/marketing if they could sell it locally. Including these non-traditional ingredients in organic poultry feeds will give producers a market that they may not otherwise have. The number of organic poultry operations, & consequently profits, might increase if feed were more readily available. Currently, access to certified organic feeds limits the number of people able to raise organic poultry. Results of the analysis of the collected organically grown feed samples demonstrate that there are similarities in the average nutrient content of organic & conventional feedstuffs but organically grown feedstuffs can have wide variations in nutrient content which will impact the formulation of consistent organic livestock feeds. Environmental impact- Encouraging organic operations-poultry and crop-would be beneficial to the environment. Organic crop operations would decrease pesticide usage & reduce erosion. Quality of life impact- By increasing the economic sustainability of organic production (crops & poultry) the project will have a long-term effect on the quality of life of rural families. It will allow them to maintain their lifestyle choice.

2005/01/01 TO 2005/12/31 Economic impact - The project is expected to impact rural families throughout the midwest - those producing organically grown crops as well as those raising certified organic poultry. Locally grown organic feed would be cheaper than imported organic feed. In addition, producers growing some of the feedstuffs (e.g, buckwheat, field peas) could perhaps use them in their own organic poultry feed. Organic crop producers would save on transportation/marketing if they could sell it locally. Also, including these non-traditional ingredients in organic poultry feeds will give producers a market that they may not otherwise have. The number of organic poultry operations, and consequently profits, might increase if feed were more readily available. Currently, access to certified organic feeds limits the number of people able to raise organic poultry. Environmental impact - Encouraging organic operations-poultry and crop-would be beneficial to the environment. Organic crop operations would decrease pesticide usage and reduce erosion. Quality of life impact - By increasing the economic sustainability of organic production (crops and poultry) the project will have a long-term effect on the quality of life of rural families. It will allow them to maintain their lifestyle choice.

2004/01/01 TO 2004/12/31 The wide variability in nutrient content of organic feed ingredients will complicate their use in organic poultry diets. Most organic feed mills do not have easy access to the laboratory facilities necessary for determination of the nutrient content of feedstuffs. As a result, they will have to use wide margins of safety in their feed ration formulations. Many of the organic poultry producers are also marketing their products as omega-3 enriched. They are increasing the omega-3 levels of eggs and poultry meat by supplementing poultry diets with flax. Such producers will have trouble guaranteeing the omega-3 enriched status of their products if they can not be sure of the fat and omega-3 content of the flax they are feeding.

2003/01/01 TO 2003/12/31 The project is in the very preliminary stages but is expected to impact rural families throughout the midwest--those producing organically grown crops as well as those raising certified organic poultry. Locally grown organic feed would be cheaper than imported organic feed. In addition, producers growing some of the feedstuffs (e.g, buckwheat, field peas) could perhaps use them in their own organic poultry feed. Organic crop producers would save on transportation/marketing if they could sell it locally. Also, including these non-traditional ingredients in organic poultry feeds will give producers a market that they may not otherwise have. The number of organic poultry operations, and consequently profits, might increase if feed were more readily available. Currently, access to certified organic feeds limits the number of people able to raise organic poultry. Encouraging organic operations-poultry and crop-would be beneficial to the environment. Organic crop operations would decrease pesticide usage and reduce erosion. The project is in the very preliminary stages, but by increasing the economic sustainability of organic production (crops and poultry) it will have a long-term effect on the quality of life of rural families. It will allow them to maintain their lifestyle choice.

2002/01/01 TO 2002/12/31 The results of this project will enable producers to formulate organic poultry diets that are more economical and sustainable. This will allow family farms to remain viable.

## **PUBLICATIONS**

2006/01/01 TO 2006/12/31 1. Jacob, J.P. 2007. Nutrient content of organically grown feedstuffs. Submitted to the Journal of Applied Poultry Research 2. Jacob, J.P. 2007. Use of Illinois Bundle Flower in chick starter diets. Journal of Applied Poultry Research 16: in print

2005/01/01 TO 2005/12/31 Jacob, J.P. 2005. Alternative feedstuffs for organic poultry. Presented at the Midwest Poultry Federation Convention held in St. Paul, MN March 15-17, 2005.

2004/01/01 TO 2004/12/31 No publications reported this period

2003/01/01 TO 2003/12/31 No publications reported this period

2002/01/01 TO 2002/12/31 No publications reported this period

[↑ Return to Index](#)

# Organic Nursery Production: Development and Demonstration

<b>Accession No.</b>	0193479
<b>Subfile</b>	CRIS\
<b>Project No.</b>	FLA-QUN-04072
<b>Agency</b>	NIFA FLA
<b>Project Type</b>	OTHER GRANTS
<b>Project Status</b>	TERMINATED
<b>Contract / Grant No.</b>	2002-51106-01949
<b>Proposal No.</b>	2002-03804
<b>Start Date</b>	01 SEP 2002
<b>Term Date</b>	31 AUG 2006
<b>Fiscal Year</b>	2006
<b>Grant Amount</b>	\$93,454
<b>Grant Year</b>	2002
<b>Investigator(s)</b>	Mizell, R. F.; Knox, G. W.; Momol, T. M.; Hewitt, T. D.; Bolques, A.
<b>Performing Institution</b>	NORTH FLORIDA RESEARCH AND EDUCATION CENTER, QUINCY, UNIVERSITY OF FLORIDA, GAINESVILLE, FLORIDA 32610

## NON-TECHNICAL SUMMARY

A. Consumers desire products grown with less environmental impact. B. Organic production is one method of meeting consumer needs for alternative products. C. Consumers need to be educated about environmental issues. D. Gardening and landscaping are very important consumer activities. E. Organic production and marketing of nursery products is one approach to providing solutions to the defined needs. A. Produce nursery products organically. B. Develop marketing schemes to sell them.

## OBJECTIVES

To evaluate and develop for horticultural zones 7-9 organically-grown nursery plants in marketing categories as follows: color cachet plants, pest free (insect free and disease resistant) plants, and butterfly garden plants. To evaluate their economic potential and develop a marketing scheme for one product line as a model. To demonstrate to growers the culture and management practices including pest management tools, the economics and the marketing plans necessary to grow and market the new product lines.

## APPROACH

Plants in each of the categories will be selected and grown using the same procedures as follows: the project investigators and cooperators will initially select 5-10 candidate plant species or cultivars that have potential for serving in each of the functional categories. Cuttings or liners will be obtained to begin the first production cycle. Plant material for the following cycles will be taken from the plants grown in the first cycle or additional plants set aside for that purpose. The cuttings will be rooted in a certified mist bed in preparation for planting. The liners will be cleaned by removing and discarding all attached soil. Initially, 5-20 plants/species (depending on our current knowledge of the individual species) will be placed in 1 gal containers in typical 1:1 bark, peat and sand media of known origin that will meet organic certification standards. We will concentrate on plant species that can be

grown to marketable size in 12-16 weeks. But the plants will be grown for as long as necessary to reach a saleable size and quality. All required inputs such as fertilizers and pesticides will be organically certified and selected and purchased from organically certified producers based on a list of products provided by the Organic Materials Review Institute. Each plant species will be grown to saleable size and quality for three production cycles and evaluated for its ease of production, quality and economics by the co-PIs and with the help of our cooperators and selected local Master Gardeners and county agents. Based on the evaluation statistics we will end up with at least 5 plant species/category to demonstrate and evaluate further for organic marketing. We will develop the following deliverables: organic production and marketing brochures per each plant category, website on project accomplishments and recommendations, plant tags aimed at marketing for each plant category, pest profiles and associated pest risk and lists of organic solutions that are effective for the pests observed, scientific journal and popular media articles and articles specifically aimed at organic and nursery producers. We will develop the following deliverables: organic production and marketing brochures per each plant category, website on project accomplishments and recommendations, plant tags aimed at marketing for each plant category, pest profiles and associated pest risk and lists of organic solutions that are effective for the pests observed, scientific journal and popular media articles and articles specifically aimed at organic and nursery producers.

## PROGRESS

2002/09 TO 2006/08 OUTPUTS: A series of experiments evaluated organic methods of production as compared to conventional production of container-grown ornamental crops under USDA Cold Hardiness Zone 8 and AHS Heat Zone 9 (Gulf Coast) conditions. These experiments evaluated organic substrate components, organic fertilizers and alternatives to conventional pesticides. These activities were reported at the annual Southern Nursery Association Research Conference, at the Florida State Horticultural Society meeting and at various field days held at the University of Florida/IFAS North Florida Research and Education Center, Quincy.

PARTICIPANTS: Edwin R. Duke, Ph.D. Associate Professor Ornamental Horticulture and Landscape Design & Management Florida A&M University 306 Perry Paige South Tallahassee FL 32307 850-599-3260 850-412-7536 edwin.duke@famu.edu TARGET AUDIENCES: Nursery growers, organic growers, county agents and horticulture professionals.

2004/10/01 TO 2005/09/30 Efforts are underway to develop organic and other container nursery production strategies that offer greater environmental sustainability while reducing costly inputs of chemical pesticides, synthetic fertilizers, imported media components and water. Strategies for reducing pesticide use will enable nursery growers to produce quality plants while reducing costs and minimizing potential environmental contamination. Locally available organic materials could be a cost-effective, renewable source of nutrients and substrate components for producing quality container-grown landscape plants. Use of nutrient-rich organic substrate amendments will provide nutrients that may partially substitute for high-cost, synthetic fertilizers and substitute for more expensive imported peat. Alternative weed control using reusable synthetic disks may reduce use of chemical herbicides. Fiber containers are biodegradable alternatives to conventional plastic containers. In 2005, we completed an experiment examining growth of conventional and organically grown plants shifted to larger containers, including a comparison of conventional plastic containers and fiber containers (made from recycled wood products). *Lagerstroemia cv. Apalachee* plants were grown conventionally and organically in #1 containers in 2003. In 2004, these plants were potted into #3 containers using conventional and blended substrates, conventional and organic fertilizers, and conventional plastic and alternative fiber containers. These plants completed their crop production cycle in Summer 2005 and were evaluated. Also in 2005, we evaluated two treatments of an organic fungicide as compared to a conventional synthetic fungicide and an untreated control. Treatments were applied to *Hydrangea macrophylla cv. Nikko Blue* growing in #3 containers, and foliage was evaluated weekly for leafspot throughout a 90-day period. For both experiments, analyses of data are ongoing and a final report is being prepared.

2003/10/01 TO 2004/09/30 Efforts are underway to develop organic and other container nursery production strategies that offer greater environmental sustainability while reducing costly inputs of chemical pesticides, synthetic fertilizers, imported media components and water. Strategies for reducing pesticide use will enable nursery growers to produce quality plants while reducing costs and minimizing potential environmental contamination. Locally available organic materials could be a cost-effective, renewable source of nutrients and substrate components for producing quality container-grown landscape plants. Use of nutrient-rich organic substrate amendments will provide nutrients that may partially substitute for high-cost, synthetic fertilizers and substitute for more expensive imported peat. Alternative weed control using reusable synthetic disks may reduce use of chemical herbicides. Fiber containers are biodegradable alternatives to conventional plastic containers. In 2004, one experiment used conventional and blended substrates along with conventional and organic fertilizers

and conventional pre-emergent herbicide and synthetic disks to grow a crop of Lantana 'New Gold'. This project provided a second year of data for production and pest management. One experiment used conventional and organic fertilizers to grow a crop of Cuphea hyssopifolia, providing a second year of production and pest management data. Two experiments used conventional and organic fertilizers and conventional plastic and alternative fiber containers to grow crops of Salvia x 'Indigo Spires' and Spermacoce verticillata. An additional experiment used #1 Lagerstroemia 'Apalachee' plants grown conventionally and organically the previous year. These plants were potted into #3 containers using conventional and blended substrates, conventional and organic fertilizers, and conventional plastic and alternative fiber containers. This experiment is ongoing and will be completed in Spring 2005. A final experiment involved cutting propagation of Lagerstroemia 'Apalachee', Salvia x 'Indigo Spires' and Spermacoce verticillata. Conventional propagation using IBA in talc was compared to three organic propagation methods: IAA solution, willow extract and absence of treatment. Analyses of data is ongoing.

2002/10/01 TO 2003/10/01 Efforts are underway to develop organic and other container nursery production strategies that offer greater environmental sustainability while reducing costly inputs of chemical pesticides, synthetic fertilizers, imported media components and water. Strategies for reducing pesticide use will enable nursery growers to produce quality plants while reducing costs and minimizing potential environmental contamination. Locally available organic materials could be a cost-effective, renewable source of nutrients and substrate components for producing quality container-grown landscape plants. Use of nutrient-rich organic substrate amendments will provide nutrients that may partially substitute for high-cost, synthetic fertilizers and substitute for more expensive imported peat. One experiment analyzed physical and chemical properties of a conventional substrate blended with up to 30% by volume of worm castings, chicken manure compost, and mushroom compost. Organic substrate amendments of worm castings and mushroom compost at levels of 10 to 30% provide appropriate physical and chemical properties and are suitable as substitutes for peat in soilless mixes. Three experiments used conventional substrate and blended substrates along with conventional and organic fertilizers to grow crops of geranium (Pelargonium X hortulanum 'Patriot Bright Red'), Lantana 'New Gold', Buddleja 'Royal Red', Evolvulus 'Blue Daze', Cuphea hyssopifolia, and Lagerstroemia 'Apalachee'. All treatments produced marketable plants, although plants typically grew larger with conventional fertilizer. Two of these experiments included evaluations of weed management techniques involving synthetic pre-emergent herbicide, natural pre-emergent herbicide (corn gluten meal), copper-coated synthetic disks and pine bark mulch plus natural pre-emergent herbicide. Results to-date suggest most alternative weed management treatments can produce a crop of equal quality to that with conventional pre-emergent herbicides.

2002/09/01 TO 2002/11/25 This project was recently awarded and we have initiated the research. Progress to date includes hiring of support staff, gathering of materials and initiation of preliminary experiments.

## IMPACT

2002/09 TO 2006/08 A series of experiments evaluated organic methods of production as compared to conventional production of container-grown ornamental crops under USDA Cold Hardiness Zone 8 and AHS Heat Zone 9 (Gulf Coast) conditions. In general, organic substrate components, organic fertilizers and alternatives to conventional pesticides were easily adopted into otherwise conventional systems of container-grown ornamentals. Furthermore, organic and other alternative container nursery production strategies will reduce use of chemical pesticides, synthetic fertilizers, imported media components and water while offering greater environmental sustainability. However, organic methods of disease management were less effective than conventional pesticides. Lack of effective disease management is a major impediment to organic production of ornamental plants since plant appearance is critical to customer expectations and sales. We believe conventional overhead irrigation contributed to disease pressure because of foliar wetting. Although untested, shifting irrigation systems to microirrigation, in which foliage is not significantly moistened, would reduce foliar wetting and concomitant foliar diseases, thereby making organic management of diseases more effective. Costs of organic methods (unit component costs and amount of labor) generally were greater. Costs of organic components should decrease as they become more readily available and as they are used in larger quantities (i.e., "economies of scale" eventually reduce prices). While organic methods can be used to produce container-grown ornamentals, crop selection will be of paramount importance for economically viable organic production of ornamentals. Crops requiring lower fertility regimes, shorter production cycles, and fewer pesticide treatments will be more easily and more economically adapted to organic methods of production. Finally, a consumer choice study was performed in a commercial retail garden center to evaluate pricing of organic vs. conventional

ornamentals. Results showed that pricing was important to consumers, even though customers of this particular retail garden center are considered more environmentally conscious than those at other garden centers. These results suggest that smaller price premiums are needed or marketing campaigns will be necessary to convince consumers to pay significant price premiums for organically grown landscape plants. This issue deserves greater study. \*\*PUBLICATIONS (not previously reported):\*\* 2002/09 TO 2006/08 1. Bolques, A., E.R. Duke, G.W. Knox and T. Hewitt. 2004. Consumer acceptance of an organically grown ornamental. Proc. Fla. State Hort. Soc. 117: 326-328. 2. Bolques, Alejandro, M. Timur Momol, Gary Knox, Laura Ritchie, James H. Aldrich and Hank Dankers. 2006. Efficacy of organic bio-fungicides on *Cercospora* and *Corynespora* leaf spot on container-grown hydrangea. Proc. S. Nursery Assn. Research Conf. 51: 201-203. 3. Duke, E.R., G.W. Knox, A. Bolques and R. Mizell. 2004. Efficacy of conventional and alternative methods of weed control. Proc. S. Nursery Assn. Research Conf. 49: 105-107. 4. Duke, E.R., G.W. Knox, A. Bolques, and S. Bos. 2003. Growth of geranium using organic fertilizers and alternative substrate components. Proc. S. Nursery Assn. Research Conf. 48:88-90. 5. Duke, E.R., G. W. Knox, A. Bolques, and S. Bos. 2003. Utilization of alternative organic amendments as substrate components: physical and chemical properties. Proc. S. Nursery Assn. Research Conf. 48:64-67. 6. Duke, E.R., G.W. Knox, and A. Bolques. 2004. Conventional versus alternative methods of weed control in a container nursery. Proc. Fla. State Hort. Soc. 117: (accepted and manuscript in press).

2004/10/01 TO 2005/09/30 Organic and other alternative container nursery production strategies will reduce use of chemical pesticides, synthetic fertilizers, imported media components and water while offering greater environmental sustainability.

2003/10/01 TO 2004/09/30 Organic and other alternative container nursery production strategies will reduce use of chemical pesticides, synthetic fertilizers, imported media components and water while offering greater environmental sustainability.

2002/10/01 TO 2003/10/01 Organic and other alternative container nursery production strategies will reduce use of chemical pesticides, synthetic fertilizers, imported media components and water while offering greater environmental sustainability.

2002/09/01 TO 2002/11/25 At the end of the project we will have identified nursery plant species that can be grown under the new federal guidelines for organic certification. We will also have developed marketing strategies and demonstrated the approach and results to the public.

## **PUBLICATIONS**

2004/10/01 TO 2005/09/30 Bolques, A., E.R. Duke, G.W. Knox and T. Hewitt. 2004. Consumer acceptance of an organically grown ornamental. Proc. Fla. State Hort. Soc. 117: 326-328.

2003/10/01 TO 2004/09/30 1. Duke, E.R., G.W. Knox, A. Bolques and R. Mizell. 2004. Efficacy of conventional and alternative methods of weed control. Proc. S. Nursery Assn. Research Conf. 49: 105-107. 2. Duke, E.R., G.W. Knox, and A. Bolques. 2004. Conventional versus alternative methods of weed control in a container nursery. Proc. Fla. State Hort. Soc. 117: (accepted and manuscript in press). 3. Bolques, A., E.R. Duke, G.W. Knox and T. Hewitt. 2004. Consumer acceptance of an organically grown ornamental. Proc. Fla. State Hort. Soc. 117: (accepted and manuscript in press).

2002/10/01 TO 2003/10/01 1. Duke, E.R., G.W. Knox, A. Bolques, and S. Bos. 2003. Growth of Geraniums Using Organic Fertilizers and Alternative Substrate Components. SNA Research Conference 48: 88-90. 2. Duke, E.R., G.W. Knox, A. Bolques, and S. Bos. 2003. Utilization of Alternative Organic Amendments as Substrate Components: Physical and Chemical Properties. SNA Research Conference 48: 64-67.

2002/09/01 TO 2002/11/25 No publications reported this period

[↑ Return to Index](#)