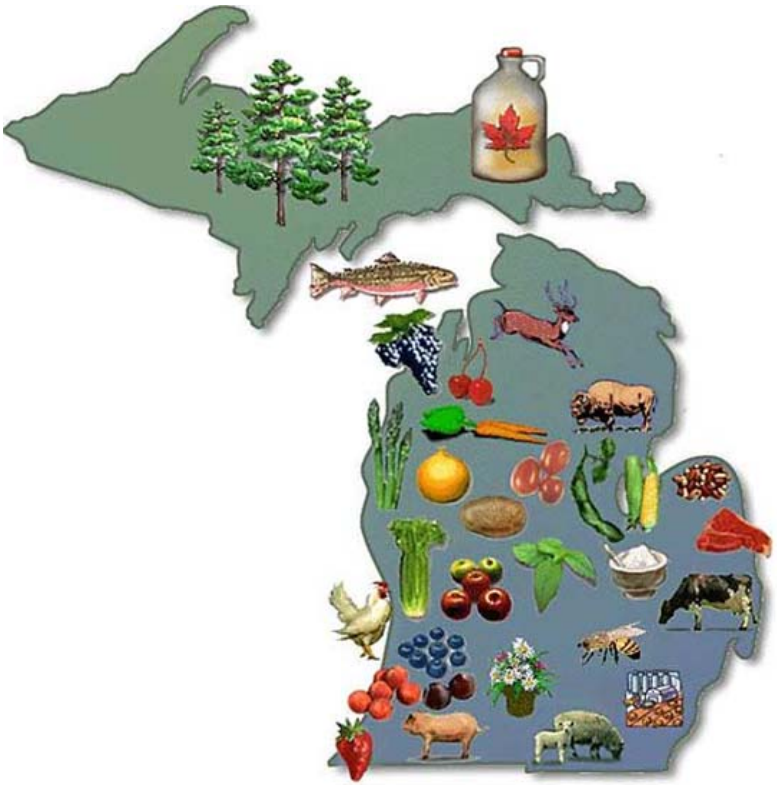
Michigan Organic Food & Farming Reporting Session & Poster Contest



Friday, March 5, 2010

MSU Kellogg Conference Center

Presenters

I. Four Generations of Sustainable Practices – A Case Study of a Northern Michigan Organic Family Farm, Matt Raven, Department of CARRS, Michigan State University, East Lansing, MI 48824

II. Organic Production of Fruit Crops Under High Tunnels, Gregory Lang, Department of Horticulture, Michigan State University, East Lansing, MI 48824

III. Organic Fertilization Options for Blueberries, Eric Hanson[1], Annemiek Schilder[2] and Jesse Sadowsky[2], [(1)]Department of Horticulture, Michigan State University, East Lansing, MI 48824 [(2)]Department of Plant Pathology, Michigan State University, East Lansing, MI 48824

IV. Climbing Mt. Organic: Three Phases of Complex Non-Linear Open Systems, George W. Bird, Department of Entomology, Michigan State University, East Lansing, MI 48824

V. Conservation Biological Control of Vegetable Insect Pests in Organic Production Systems, Daniel M. Pavuk, Monroe County/ Michigan State University Extension, 963 S. Raisinville Rd, Monroe, MI 48161

VI. Evaluation of OMRI-Approved Fungicides and Cultural Methods for Control of Grape Diseases, Annemiek Schilder[1], Jerri M. Gillett[1], and Roger W. Sysak[1], [(1)]Department of Plant Pathology, Michigan State University, East Lansing, MI 48824.

Posters

I. Adoption of Organic Agriculture by Hispanic Farmers in Michigan, Lourdes Martiniez PHD Student, Department of CARRS, Michigan State University, East Lansing, MI 48824

II. Effects of organic and conventional management on plant health and soil biology in Michigan blueberries, Jesse Sadowsky[1], Eric Hanson[2], Stuart Grandy[3], Jianjun Hao[1], and Annemiek Schilder[1, (1)]Department of Plant Pathology, Michigan State University, East Lansing, MI 48824 [(2)]Department of Horticulture, Michigan State University, East Lansing, MI 48824 [(3)]Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824

III. The Use and Impacts of Glyphosate and Pyraclostrobin in Soybean and Sugar Beet Farming: Selected Socio-Ecological Issues in Michigan's Huron, Sanilac, Lapeer and Tuscola Counties, USA, Lesley Atwood, Department of CARRS, Michigan State University, East Lansing, MI 48824

IV. Improvement of Open Rearing Biological Control Systems in Michigan Organic Greenhouses, Emily Pochubay[1], Matt Grieshop[1], Jeanne Himmelein[2], and Mark Elzinga[3], [(1)] Department of Entomology, Michigan State University, East Lansing, MI 48824, [(2)] MSU Extension, Kalamazoo County, Nazareth, MI 49074, [(3)] Elzinga Hoeksema Family Greenhouses, 906 E. Centre St., Portage MI 49002

V. Post-emergence Propane Flaming for Non-Chemical Weed Control in Snap Bean and Carrot, Chad M. Herrmann[1], Bernard H. Zandstra[1], [(1)] Department of Horticulture, Michigan State University, East Lansing, MI 48824

VI. Conservation strips of native perennials to enhance beneficial insect abundance in commercial blueberry fields, Nathaniel Walton[1] and Rufus Isaacs[1], [(1)] Department of Entomology, Michigan State University, East Lansing, MI 48824

VII. Winter squash as trap crop to manage striped cucumber beetle in organic cucumber production, Vianney Willot, Department of Entomology, Michigan State University, East Lansing, MI 48824

VIII. Optimizing Vetch Variety Choices in Strip-Tilled Sweet Corn, Ben Henshaw, Department of Horticulture, Michigan State University, East Lansing, MI 48824

IX. Organic Hop Production in Michigan Apple Orchards: Year One Results, Benjamin Phillips[1], Matthew Grieshop[2], Jim Koan[3], [(1)]Department of Entomology, Ohio State University, Wooster, OH 44691 [(2)]Department of Entomology, Michigan State University, East Lansing, MI 48823 [(3)]AlMar Orchards, 1431 Duffield Road, Flushing, MI 48824

X. The Impact of Biodiversity During the Transition to Organic Production, Ajay Nair[1], Mathieu Ngouajio[1], John A. Biernbaum[1], George W. Bird[2], Sieglinde S. Snapp[3,4] and Dale R. Mutch[4], [(1)]Department of Horticulture, East Lansing, MI 48824 [(2)]Department of Entomology, Michigan State University, East Lansing, MI 48824 [(3)]Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824 [(4)]W.K. Kellogg Biological Station, 3700 East Gull Lake Drive, Hickory Corners, MI 49060

XI. Evaluation of Dry Bean Genotypes for Performance Under Organic Production Systems, James Heilig, Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824.

Presenters

Farm Viability

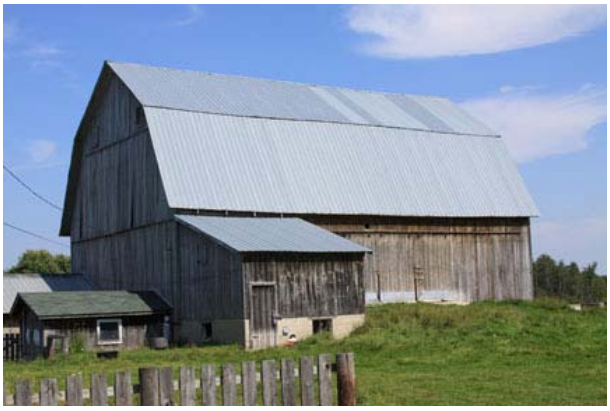
Four Generations of Sustainable Practices – A Case Study of a Northern Michigan Organic Family Farm, Matt Raven, Department of CARRS, Michigan State University, East Lansing, MI 48824

Lars and Benedickta Augustinesson homesteaded Coe Creek Farm in 1873. Since then their descendants have farmed the land in an unbroken line. Betsy Erickson, their great granddaughter, and her husband Runo Lorentzon currently run the farm. The research question that guided this case study is how have four generations been able to retain this small family farm? The study was a qualitative, naturalistic study that used a case study methodology to answer the research question. The researcher conducted three interviews of the current owners at Coe Creek Farm during the winter of 2010. Furthermore, the researcher is a great-great grandson of the Augustinesson's and has extensive experience at the farm over the past 38 years. The researcher transcribed all answers as they were given. Also a number of family papers were obtained to provide additional data for the study.

The original homestead was 80 acres. Additional adjacent acreage was added as it became available and sufficient capital was on hand. Currently Coe Creek Farm is 500 acres mostly in pasture and woods. Sheep have been the economic base of the farm since it was homesteaded with lambs and wool being the primary source of income for over a century. Beef cattle have also been an important income producer off and on over the years. The four generations responsible for managing Coe Creek Farm have used sustainable agricultural practices since it was homesteaded. Betsy and Runo assumed day-to-day responsibility for the farm in 1972 and transitioned all operations to organic agriculture during the late 70s. There have not been any commercial fertilizers applied to the pastures in Coe Creek Farm since it was homesteaded. Composted animal manure and legumes have been the base fertilizer with marl as the primary soil amendment.

Currently, they are raising 120 Polypay ewes and 16 Shorthorn/Devon cows. Sheep and cattle are pasture-based browsing during the spring, summer and fall. During the winter they are fed farm-raised hay. They utilize rotational grazing for pasture management and electric netting for predator control. They augment their income with produce from an organic vegetable garden equipped with two hoop houses, honey from their bee yard, maple syrup from their sugar bush, and value-added products such as baked goods, beeswax candles, wool products, and felted products. Since 2007 the majority of these items have been sold at the LeRoy Farmers Market.

The economic thread running through the four generations that have managed Coe Creek Farm has been to live within their means while leveraging time-honored practices and skills. For example, family members using lumber milled from trees grown on the property have built all of the houses and outbuildings on the farm. Sheep are still shorn with hand shears rather than by machine. Family members have obtained personal fulfillment from working in harmony with the land rather than pursuing continued growth to increase economic wealth. The farm provides their needs while also helping feed the community. Coe Creek Farm provides a sterling example of how critical a family's culture is in addition to environmental and economic stewardship resulting in a farm that can be sustained generation after generation.



Fruit Production

Organic Fertilization Options for Blueberries, Eric Hanson[1], Annemiek Schilder[2] and Jesse Sadowsky[2], [(1)]Department of Horticulture, Michigan State University, East Lansing, MI 48824 [(2)]Department of Plant Pathology, Michigan State University, East Lansing, MI 48824

An issue consistently identified by Midwest organic blueberry growers is how to manage fertility where various surface mulches (e.g. straw, hay, bark, woodchips) and nutrient sources (composts, organic fertilizers) are used. We have begun studies to better understand how these materials interact to affect soil nitrogen (N) availability and plant nutrition. Efforts include field experiments on an organic blueberry planting on the MSU campus and on commercial organic farms. We have also started studies to simulate field conditions using soil columns in order to

test more nutrient source/mulch combinations. Blueberries have a high demand for N for about 8 weeks after bloom. Field study results suggest that N release from two plant based organic fertilizers (Nature-Safe, McGeary's) applied in April is fairly well synchronized with plant demand. There appeared to be little delay in N release from these materials, suggesting that application in the early spring may not be efficient. High N (C:N = 9:1) and low N (42:1) composts were monitored. As expected, the low N material supplied little available soil N, whereas the high N material released large quantities soon after application. Release of inorganic N from the high N compost diminished dramatically after July, similar to the release patterns seen for organic fertilizers. Mulches (straw, bark, wood chips) had dramatic affects on the amount of inorganic N leaching through soil columns. Adding mulch reduced the amount of N leaching from columns by half, compared non-mulched columns.

Organic Production of Fruit Crops Under High Tunnels, Gregory Lang, Department of Horticulture, Michigan State University, East Lansing, MI 48824

Fresh raspberries and sweet cherries are high value crops with strong consumer demand. Nearly all such fruits, conventional or organic, sold by Midwest region grocers are produced in the Pacific coast states and shipped to the region. Given the price premiums and increasing demand for locally grown and organic fruits, production of these could enhance profitability and crop diversity for organic farmers in the Midwest. However, there is almost no organic production of fresh cherries and raspberries in the Midwest, mostly due to the warm humid conditions that create diverse insect/disease/weed complexes. Research at the MSU Clarksville and Southwest Experiment Stations over the past 5 years on the development of multi-bay, 3-season high tunnel production systems for fresh market raspberries and sweet cherries will be discussed in the context of opportunities and challenges for organic production of these high value, perennial fruit cropping systems. Also to be outlined will be the new Ceres Organic Trust project associated with the MSU Student Organic Farm to develop these organic production systems, focusing initially on organic soil building strategies within the challenges of the 3-season tunnel environment and perennial crops that preclude some traditional approaches to soil management (e.g., crop rotation, annual cover cropping, incorporation of organic amendments). Key insect pests and diseases will be identified, and control strategies tested, in concert with the plant responses to organic soil management strategies and the modified tunnel environment.

Organic Pest Management

Climbing Mt. Organic: Three Phases of Complex Non-Linear Open Systems, George W. Bird, Department of Entomology, Michigan State University, East Lansing, MI 48824

Organic agriculture enterprises are complex nonlinear open systems. They are: 1) composed of two or more interactive parts, 2) living systems that can replicate themselves, take in matter and energy and give off residuals, 3) open with self-organization and emergent properties and 4) if not managed properly will contain positive feedback as a potential catalyst for major and rapid change at some critical turning point. There are three phases of complex non-linear open

systems: 1) growth [anti-entropic with more matter and energy being taken in than released], 2) dynamic equilibrium [amount of energy entering the system is equal to the amount leaving the system] and 3) senescence [entropic with the amount of energy being released is greater than that taken in]. Soil biology data from the Michigan State University, Kellogg Biological Station, Long Term Ecological Research project will be used to illustrate why organic agriculture is a complex non-linear open system. Alternative natural and managed plant-based systems studied in this project will be discussed in relation to their anti-entropic, equilibrium or entropic attributes. A strong case will be made to demonstrate why an understanding the nature of complex non-linear open systems will enhance the probability of success in the process of 'Climbing Mt. Organic [exploring the foothills, mastering the slippery slopes and life at the summit]. It is always important to remember that in 1916, Liberty Hyde Bailey wrote, *if the growers knows why, he will teach himself how*.

Conservation Biological Control of Vegetable Insect Pests in Organic Production Systems, Daniel M. Pavuk, Monroe County/Michigan State University Extension, 963 S. Raisinville Rd, Monroe, MI 48161

Organic vegetable production requires the use of production methods that are approved for such production. Control of vegetable insect pests must be achieved in organic production systems through the use of cultural, biological, and chemical methods. Few insecticides have been approved for use in organic vegetable production systems, so more emphasis must be placed on cultural and biological methods to manage insect pests. The objective of my research is to study ways of increasing populations of beneficial arthropods, specifically, predatory insects, parasitoid wasps and flies, and spiders in organic vegetable systems so that natural, biological control of insect pests can be improved. My recent observations of habitats associated with vegetable production systems in SE Michigan and NW Ohio, and a considerable literature review performed by me over the past ten years, indicates that there are several viable approaches to the conservation of natural enemies of vegetable insect pests within and adjacent to production fields. My talk will discuss some of these methods and also highlight research projects in the coming season that will address the conservation of biological control of insect pests in organic vegetable production systems. The findings of these research investigations may help improve biological control of vegetable insect pests in organic production systems.

Evaluation of OMRI-Approved Fungicides and Cultural Methods for Control of Grape Diseases, Annemiek Schilder[1], Jerri M. Gillett[1], and Roger W. Sysak[1], [(1)]Department of Plant Pathology, Michigan State University, East Lansing, MI 48824.

Fungal diseases present a continuous challenge to grape producers in Michigan because of the humid climate. Due to the limited number of control options available in organic production,

these diseases are difficult to control, particularly black rot. The objective of this study was to evaluate the efficacy of OMRI-approved fungicides for control of grape diseases. The experiment was conducted in a 'Niagara' vineyard at the Trevor Nichols Research Complex in Fennville, MI. The following fungicides were evaluated in 2008: Serenade Max (*Bacillus subtilis*), Sonata (*Bacillus pumilis),* JMS Stylet Oil (paraffinic oil), Neu 1160 Vegetable Oil (canola oil), Sporan (rosemary oil, clove oil, thyme oil, wintergreen oil), Kaligreen (potassium bicarbonate) and Nordox (cuprous oxide). In 2009, we evaluated Oxidate (hydrogen dioxide), JMS Stylet Oil, Serenade Max, Sonata, and Kaligreen at different rates and concentrations. Nu-Film-17, a sticker-extender, was added to some products according to label instructions in 2008; in 2009, we used Nu-Film-P, which is OMRI approved. Nu-Film-P by itself was also tested. In 2009, we also applied two sanitation treatments (removal of canes and clusters from the previous season) at the beginning of the season. Treatments were applied to 3-vine plots and were replicated four times in a randomized complete block design. Sprays were applied using a research sprayer with a 3.8-gpm high flow electric pump used at 60 psi with t-jet nozzles. Spray volume was 40 gpa through bloom then 50 gpa for the remainder of the season. Sprays were applied at the following phenological stages: 1-2 in. shoot, 5-8 in. shoot, 10-16 in. shoot, 1st post-bloom, 2nd post-bloom, 3rd post-bloom, 4th post-bloom. At veraison, 25 randomly chosen clusters per plot were assessed for black rot incidence (% clusters with disease symptoms) and severity (% area affected on diseased clusters only). Phomopsis fruit rot and rachis infection and foliar diseases (powdery mildew, downy mildew) were visually assessed at harvest. Disease pressure was high in both years. The biofungicides Serenade and Sonata (with added adjuvant Nu-Film) provided good control of black rot, Phomopsis, downy mildew and powdery mildew (Table 1). Other treatments were less effective, although all of them were statistically superior compared to the untreated control. In 2009, all treatments significantly reduced black rot and Phomopsis pressure, including sanitation and Nu-Film-P. A program alternating four different biocontrol agents also provided excellent control. Based on the results, we feel that organic growers have commercially viable options for control of grape diseases, including black rot and Phomopsis. Serenade and Sonata are the most promising overall; however, we believe that the addition of Nu-Film-P is important to improve efficacy and recommend the use of this (or similar) adjuvant. There did not appear to be a big difference between the full and half rates of Serenade and Sonata, which might make them more economical but still effective when used at a reduced rate. A regular spray schedule and thorough coverage are critical to optimizing biocontrol products.

Posters

Organic Marketing

Adoption of Organic Agriculture by Hispanic Farmers in Michigan, Lourdes Martiniez, Department of CARRS, Michigan State University, East Lansing, MI 48824

According to a recent study the demand for locally grown organic fresh produce continues to grow (Dimitry and Obelholtzer, 2009). In the Midwest and Michigan, wholesale and retail traders have expressed their interest in sourcing more fresh produce from organic farmers in the region (Martinez, Bingen, Conner 2009). However, supply remains limited. Hispanic farmers have become an important segment of producers in Michigan. According to the 2007 Census of Agriculture, Michigan has over 650 Hispanic farmers, mostly operating family farms (Census, 2009). However, the Michigan Department of Agriculture does not report any Hispanic farmer as operating certified organic farms (MDA, 2009). Although several studies have placed economic factors as important motivations for farmers to certify their farms (Klonsky, 2000; Kuepper, 2002; Klonsky and Green 2005), preliminary results from Michigan show that in many cases Hispanic farmers lack information about organic practices. Information that focuses specifically on understanding the perspective of small-scale Hispanic farmers and their current strategies to transition to organic agriculture is currently nonexistent.
The purpose of this study is to examine the main reasons Hispanic farmers in Michigan have not make more progress to certify their operations, and to explore what they see as opportunities and constraints to certify. In order to address these objectives, personal interviews and group meetings with 43 Hispanic farmers were conducted around the state. During these interviews, farmers provided information about their production and demographic characteristics, opinions about organic agriculture and reasons to “go organic”.
Preliminary results show that most respondents fear problems such as pest infestation or market conditions are not suitable to transition to organic agriculture. Some of these farmers struggle to make their farms viable. Usually, they take on another job to support their families. For many of these farmers, organic represents a practice that could require more time and dedication than they are willing to allocate. On the other hand, for those farmers interested in organic agriculture, limited technical support and knowledge about alternative markets are the main constraint to certify their land.
This study provides important information to understand the challenges Hispanic farmers face in Michigan with regard to transition to organic agriculture and the best alternatives to effectively help them make the decision to utilize more sustainable agricultural practices. For agricultural educators and extension agents it represents an opportunity provide up-to-date tools for farmers interested in organic practices, and can also help manage some of the risks involved in transitioning and growing organic products

Fruit Production

Effects of organic and conventional management on plant health and soil biology in Michigan blueberries, Jesse Sadowsky[1], Eric Hanson[2], Stuart Grandy[3], Jianjun Hao[1], and Annemiek Schilder[1, (1)]Department of Plant Pathology, Michigan State University, East Lansing, MI 48824 [(2)]Department of Horticulture, Michigan State University, East Lansing, MI 48824 [(3)]Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824

Michigan has 19,000 acres of cultivated blueberries and ranks as the number one blueberry producing state in the U.S. Many blueberry growers are considering transitioning from

conventional to organic methods, but a lack of understanding of biological differences between these management systems has hindered adoption of organic production practices in the region. Ericoid mycorrhizae (ERM) are symbioses between roots of ericaceous plants, such as blueberries, and specialized soil fungi. In unmanaged ecosystems, ericaceous plants have a near-obligate dependency on ERM for acquisition of soil nutrients. ERM fungi produce a range of hydrolytic and oxidative enzymes that break down soil organic matter into biologically available forms, which can then be taken up by fungal hyphae and transferred to the host plant. Labile, or readily available, soil carbon (C) is a major energy source for soil organisms and is affected positively by organic management, but has not been studied in blueberry soils. Populations of free-living beneficial soil bacteria and fungi are associated with the plant disease suppression and commonly used as indicators of soil health. The goal of this study was to compare plant and soil health in organic and conventional Michigan blueberries in order to guide future research efforts. We selected eight pairs of organic and conventional blueberry fields of similar age, cultivar, and NRCS soil series. Measured indicators of plant and soil health included mycorrhizal colonization, soil enzyme activity, short-term soil respiration, cultivable soil fungal and bacterial populations, and disease incidence. We microscopically determined the mycorrhizal colonization of 25 hair-root segments per plant taken from eight plants from each of the field sites across three sampling dates in 2009. Activity of enzymes involved in the breakdown of cellulose, chitin, peptides, and lignin was assessed by adding fluorescent-tagged substrates to soil suspensions and measuring the resultant fluorescence after incubation for 1-24 hours. Labile soil C was determined as the amount of CO_2 produced during a 30-day incubation at optimal conditions (25°C and 55% water-holding capacity). Soil populations of fungi, bacteria, and *Trichoderma, Bacillus,* fluorescent *Pseudomonas*, and *Streptomyces* spp. were estimated by recording the number of colony-forming units per gram of soil on semi-selective media. Fruit rot incidence was recorded on 50 berries per site incubated for 14 days at 23°C and 100% relative humidity, and stem disease incidence was recorded on 15 bushes per site. We observed higher mycorrhizal colonization, enzyme activity (particularly chitinase), labile C, and total bacterial, *Bacillus*, *Pseudomonas*, and *Streptomyces* populations in soils under organic management. These results suggest that biological activity in soil is enhanced by organic practices and may play a greater role in plant nutrition in organic blueberry fields. A lower percentage of marketable fruit and higher incidence of anthracnose fruit rot on organic blueberries indicate that development of effective strategies for control of post-harvest diseases should receive priority in future research efforts.

Agriculture and Its People

The Use and Impacts of Glyphosate and Pyraclostrobin in Soybean and Sugar Beet Farming: Selected Socio-Ecological Issues in Michigan's Huron, Sanilac, Lapeer and Tuscola Counties, USA, Lesley Atwood, Department of CARRS, Michigan State University, East Lansing, MI 48824

Huron, Sanilac, Lapeer and Tuscola counties, Michigan, USA, currently cultivate eighty-seven percent of the land largely in soybeans, sugar beets, corn and winter wheat. Both glyphosate and pyraclostrobin are regularly applied in the region to manage pests. A public discussion emerged in the region regarding the long-term effects on soil quality and the future viability of agriculture.This research seeks to identify and discuss the inter-related socio-ecological dimensions of the long-term use of glyphosate and pyraclostrobin on soybean and sugar beet production in Michigan's Thumb region using a multidisciplinary approach. In-depth interviews with farmers will identify the social and cultural pressures of farm management in the region, as

well as, the soil quality indicators farmers reference. Potential synergies and/or long-term effects of glyphosate and pyraclostrobin on soil quality will be examined using a data-driven meta-analysis of previously conducted soil quality and pesticide research. This type of analysis encompasses an array of researches and determines if insignificant results of single experiments are statistically significant across multiple experiments. Results of this research will not only benefit the Michigan agricultural community, but also raise critical questions of the viability of today's modern agricultural practices.

Organic Pest Management

Improvement of Open Rearing Biological Control Systems in Michigan Organic Greenhouses Emily Pochubay[1], Matt Grieshop[1], Jeanne Himmelein[2], and Mark Elzinga[3], (1) Department of Entomology, Michigan State University, East Lansing, MI 48824, (2) MSU Extension, Kalamazoo County, Nazareth, MI 49074, (3) Elzinga Hoeksema Family Greenhouses, 906 E. Centre St., Portage MI 49002

The controlled environment and often times continual host availability associated with greenhouse production results in a system that is susceptible to pest population explosions. Certified organic greenhouses present interesting pest management challenges because management tactics are limited, tolerance for insect presence and damage are low, and product quality is essential for marketability. Traditionally, augmentative biological control has been used in response to pest detection. In the last several decades, researchers and greenhouse managers have become increasingly interested in open rearing systems that maintain natural enemy populations prior to pest invasions, thus preventing posed pest pressure. The experiment presented in this poster focuses on the temporal characteristics of an open rearing system. The experiment was performed from November 2009 – January 2010 at Elzinga and Hoeksema Family Greenhouses located in Portage MI. This experiment examined temporal population dynamics of the predacious mite *Amblyseius cucumeris* placed in breeder piles. Two treatments: plugged seedlings vs. potted plants were compared using five blocks with eight breeder pile repetitions per block for each treatment. At weekly intervals 10 randomly selected samples (five plugged seedling and five potted plant) were collected and mites were extracted using Berlese funnels. Mean populations displayed that *A. cucumeris* was more abundant in the potted plants compared to the plugged seedlings except at 21 days. These results suggest that plants with more foliage support higher *A. cucumeris* populations in breeder piles for a longer period of time compared to seedlings. An additional experiment will be performed at Elzinga and Hoeksema Family Greenhouses. This experiment will examine the rate of spatial spread of the aphid parasitoid *Aphidus colemani* from a centrally located banker plant. Two perpendicular transects of small barley plants with sentinel aphids will be used to map parasitism. The results of this experiment will help growers determine the optimal density of banker plants for good parasitoid coverage. A better understanding of the spatial and temporal dynamics of open rearing systems improves greenhouse growers' ability to economically manage pests using organically acceptable tactics.

Post-emergence Propane Flaming for Non-Chemical Weed Control in Snap Bean and Carrot, Chad M. Herrmann[1], Bernard H. Zandstra[1], (1) Department of Horticulture, Michigan State University, East Lansing, MI 48824

Organic vegetable growers cite inadequate weed control as the primary limiting factor in their operations. Recently, there has been a renewed interest in thermal weed control using

propane flame weeders. Preemergence flaming is often used to kill weed flushes prior to crop emergence in slow-germinating crops such as carrot, onion, and lettuce. Flaming is also used for post-emergence weed control in heat tolerant row crops such as corn and soybean. Most vegetable crops, however, are easily injured by thermal stress. To overcome crop injury and maintain maximum weed control coverage, we have constructed a weed flamer that uses heat shields to isolate the heat source from the crop. A digital precision guidance system is also installed on the weed flamer, allowing for detection of the crop row and accurate placement of the machine in relation to the crop row.

Research with the flame weeder was conducted in 2008 and 2009 in snap bean and carrot. Good selectivity was achieved in snap bean, and weed control of 80-90% was achieved for many common broadleaf weed species without causing crop injury. Carrot was more sensitive to thermal injury than snap bean. Common purslane and most grasses were difficult to control and often regrew. The most effective treatments consumed propane at a rate of approximately 20 gallons/acre.

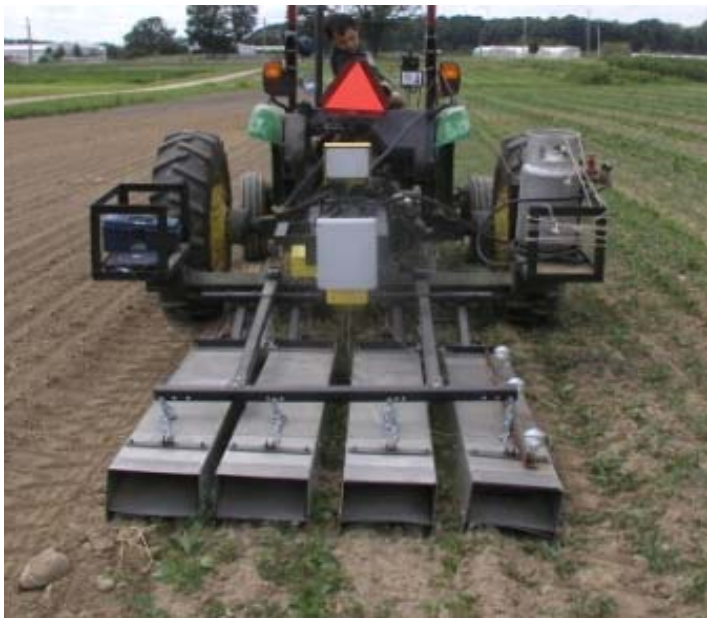


Figure 1. Configuration of the precision-guided shielded propane flame weeder. In the yellow box, a digital camera detects the crop row and allows for automated alignment of the entire machine in relation to the crop row. A 500,000 BTU liquid propane torch is mounted under each shield.

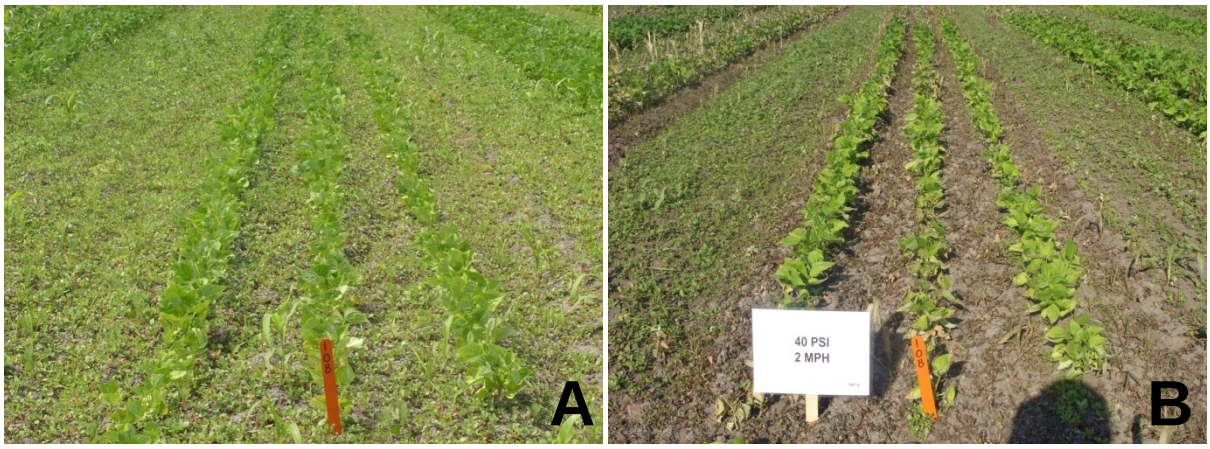


Figure 2. Pictures taken A) before and B) 7 days after treatment at 40 PSI and 2 mi/hr.

Conservation strips of native perennials to enhance beneficial insect abundance in commercial blueberry fields. Nathaniel Walton[1] and Rufus Isaacs[1], [(1)] Department of Entomology, Michigan State University, East Lansing, MI 48824

Conservation plantings of native wildflowers were established alongside blueberry fields to test the hypothesis that provision of resources for natural enemies increases their abundance in adjacent crop fields. For two growing seasons (2007 and 2008), at four commercial blueberry farms, these flowering field borders were compared to controls where growers maintained field borders of mown grass. In 2007, this revealed significant effects of treatment border, distance from border, and time-of-year on natural enemy abundance, with greater natural enemy abundance adjacent to flowering strips. Data from the 2008 growing season show similar patterns; fields with flowering borders had more natural enemies and a weaker decline in their abundance with distance from the border. In the context of these data we discuss the multi-year benefit of flowering border strips for improving natural enemy abundance in fruit crops.

Winter squash as trap crop to manage striped cucumber beetle in organic cucumber production, Vianney Willot, Department of Entomology, Michigan State University, East Lansing, MI 48824

We are evaluating trap crop method to control striped cucumber beetles in organic cucumber production. We conducted a series of experiments between 2007 and 2009 to study the attractiveness of striped cucumber beetles to four varieties of winter squash(waltham butternut, table queen acorn, blue hubbard, burgess buttercup) used as trap crop in cucumber production. The varieties blue hubbard and burgess buttercup showed the higher attractiveness

Soil Quality

Optimizing Vetch Variety Choices in Strip-Tilled Sweet Corn, Ben Henshaw, Department of Horticulture, Michigan State University, East Lansing, MI 48824

The use of leguminous hairy vetch as a cover crop in combination with reduced tillage can reduce the increasing economic and environmental costs associated with the use of fossil fuels in food production. Additional economic and environmental benefits may be realized when hairy

vetch is grown in combination with winter rye. However, high seed costs and risks associated with winter-kill and re-growth hinder the integration of hairy vetch into cropping systems; especially in Northern climates. New varieties of early-flowering, winter-hardy hairy vetch exist that may overcome these obstacles, but little is known about these varieties' performance in mixtures, or their effects on subsequent crops. To address these issues this study evaluates the effects of three hairy vetch varieties when grown alone or in combination with winter rye on a) extent of cover crop re-growth, b) degree of weed suppression, c) amount of nitrogen fixation, d) levels of available soil nitrogen, and e) yield and quality of subsequent strip-tilled sweet corn crop. We observed no remarkable re-growth of the vetch varieties despite significant differences between the timing of flowering of each variety. We expected re-growth to occur in varieties that were less than 50% flowering at the time of termination. Despite reduced initial application rates of nitrogen in cover crop plots, there were no significant differences in sweet corn yield between the bare ground, rye only, vetch only and rye-vetch plots. The soil nitrate data indicates that the cover crops supplied the initial nitrogen requirements of the sweet corn and possibly justifies the reduced rates of initial nitrogen fertilizer in the cover crop plots. The nitrate levels in the bare ground and vetch-only plots were consistently higher than in the rye and rye-vetch plots. These elevated values suggest i) an irrecoverable loss of N from the system early in the season and ii) an improvement in sweet corn yield due to greater nitrogen availability. The research will be performed again during the 2010 growing season to further investigate these findings.

New Crops for Michigan

Organic Hop Production in Michigan Apple Orchards: Year One Results, Benjamin Phillips[1], Matthew Grieshop[2], Jim Koan[3], [(1)]Department of Entomology, Ohio State University, Wooster, OH 44691 [(2)]Department of Entomology, Michigan State University, East Lansing, MI 48823 [(3)]AlMar Orchards, 1431 Duffield Road, Flushing, MI 48824

Small-scale hop (*Humulus lupulus*) production in Michigan has seen renewed interest due to hop shortages in the Western United States and Europe and increased hops prices. Apple growers using high density planting styles may have a natural advantage for hops production if their existing trellis systems can be adapted to this vine crop. Between 29 May and 24 September 2009 we planted 16 varieties of hop at the AlMar organic apple orchard in Flushing, MI. We then took weekly height measurements throughout their first year of growth and observed plant disease and foraging behavior of insects on the bines and foliage, including a spider mite damage evaluation late in the summer. The health and growth rate of the plants were tracked over time, and we found that the best growing varieties were free of mite damage. Plants with extensive mite damage often developed powdery mildew on their basal leaves, resulting in poor plant health. The best varieties in the first year were Brewer's Gold, Chinook, Pride of Ringwood, Galena and Cascade. Aside from Cascade, the top performers were all bittering hops with high alpha acid content. Very low yields were obtained in the first year of production in part due to exceptionally cool conditions. There exist at least 8 experimental hop growers in Michigan, with a large following in the Traverse City region. This research is important for Michigan growers because it will determine the feasibility of producing this high-value crop under Michigan conditions. Second year results from this project will be especially exciting because most of the first year growth takes place in the root system, from this point on the plants will be ready to spend more energy climbing and producing the valuable cones.

Organic Production

The Impact of Biodiversity During the Transition to Organic Production, Ajay Nair[1], Mathieu Ngouajio[1], John A. Biernbaum[1], George W. Bird[2], Sieglinde S. Snapp[3,4] and Dale R. Mutch[4], [(1)]Department of Horticulture, Michigan State University, East Lansing, MI 48824 [(2)]Department of Entomology, Michigan State University, East Lansing, MI 48824 [(3)]Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824 [(4)]W.K. Kellogg Biological Station, 3700 East Gull Lake Drive, Hickory Corners, MI 49060

Transition from conventional to organic agriculture is often associated with yield decline primarily due to shift in nutrient and pest management strategies. Additionally, unpredictable weather and a narrow seasonal window have posed a commendable challenge for transitional and organic vegetable farmers in the Midwest. This preliminary study looked at various levels of biodiversity with cover crops (cereal rye and hairy vetch), soil amendment (dairy compost), pest exclusion (row cover) and polyculture in organic cucumber and tomato production systems. The treatments comprised of three levels of biodiversity: low (rye + monoculture), medium (rye +

polyculture), and high (rye + hairy vetch + polyculture). Each level had compost or no compost. Polyculture system had an additional factor (presence or absence of row cover) for cucumbers. A visual assessment of the plots during the season indicated healthier plants under polyculture system. In tomato, high level of biodiversity increased fruit count and yields. Addition of compost increased yield and fruit count when added to polyculture system under rye + hairy vetch. Cucumber beetle attack resulted in unacceptable cucumber yields in the absence of row covers. Row covers thus would serve as an efficient pest and crop management strategy for organic cucumber production. Enhancing biodiversity on site through polyculture and cover cropping would certainly improve soil quality and help support population of beneficial microorganisms. Nematode community analysis revealed higher population of bacterial feeding nematodes and lower populations of spiral nematodes in the high biodiversity system. Mycorrhizal fungi population was also enhanced under the same system. Further studies on soil microbial biomass, nitrate release patterns and food quality are undergoing.

Evaluation of Dry Bean Genotypes for Performance Under Organic Production Systems, James Heilig, Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824.

The performance of 32 diverse dry bean (*Phaseolus vulgaris* L.) genotypes, including one non nodulating check, was evaluated under organic and conventional management, in side by side plots. Research was conducted at multiple locations: Kellogg Biological Station, Gull Lake, MI in 2007-2009, and in Gratiot County, MI in 2007 and 2008 and in Tuscola County in 2009. The conventional treatment was managed using recommended practices, while organic plots were managed with approved methods for certified organic production. The best performing bean genotypes were generally of the Middle American gene pool. Lower yields were often observed among large-seeded Andean types such as Kidney and Cranberry beans under both organic and conventional management. Red, pink and black seeded market classes produced highest yields as well as the highest nitrogen yield in the organic system. The black bean genotype ?Zorro? performed well at all locations and years, and across management practices.