

# Early Stages of Diversification of the Mellinger Farm

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## INTRODUCTION

Farms that achieve economies of scale by specializing and growing in size are common in US agriculture. Small and mid-sized farms, however, need a different kind of economy, economy of scope. Economies of scope rely on managing diverse enterprises, to access more profitable markets and reduced cost of off-farm inputs.

Diversified production systems have ecological and economic benefits and research, largely in developing countries (Kremen & Miles 2012). Furthermore, integrated crop and livestock systems provide increased ecosystem services including improved soil quality (Sanderson et al. 2013) and greater productivity (Cavigelli et al. 2009).

View of the Mellinger Farm from the west of the field during February 2018.



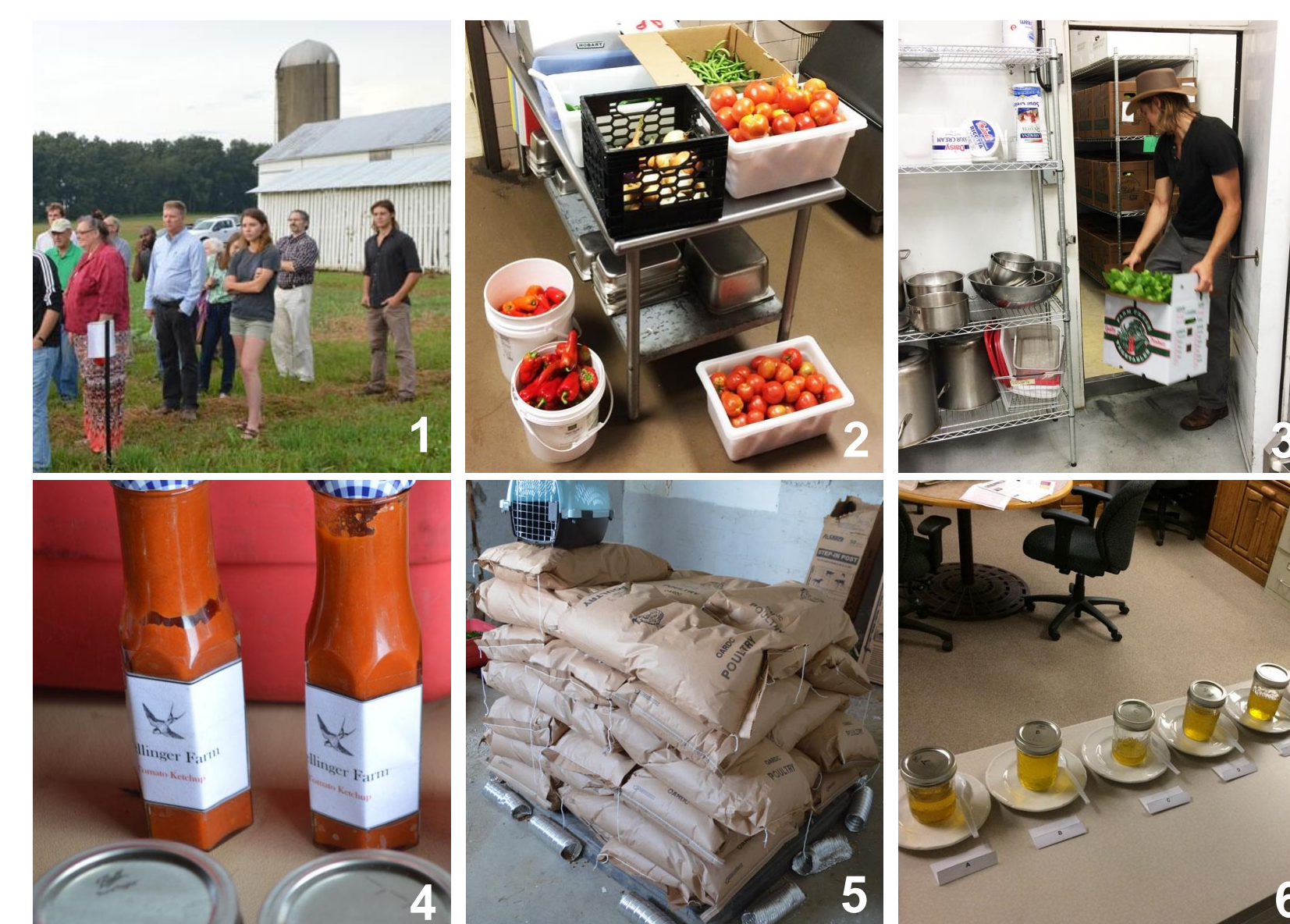
Mellinger Farm was donated to OSU in 2002. The replicated research area consisting of 2.63 acres of the west of the farmstead. We are establishing diversification scenarios in the Mellinger Farm over 3 years (2016-2018), based on economies of scope and enterprises commonly used by diversifying Ohio farmers.

Diversified Mellinger Farm research plots for measuring ecosystem services.



1. Diverse vegetable production during year 2016 & 2017. 2. view of the pasture and vegetable plots surrounded by naked oats. 3. Naked oats will provide marketable grain and supplementary feed for chicken. 4. Nine week old sunflower plot. Sunflower will supply edible oil, greens and supplementary feed for chicken. 5. Pasture raised chickens in tractors provide weed control, insect control and fertilization services. 6. Large number of ground beetles (Carabidae) and Wolf spiders (Lycosidae) reported during the insect survey in 2017 were very important predators of pest larvae and slugs, also, diverse groups of insects provide pollination services to sunflowers, vegetables and many other plants.

## Outreach and products of diversification at Mellinger Farm



1. The Mellinger Farm field day during August each year is a good opportunity for farmers and students to see what is happening in the early stages of diversification. 2. In 2016 and 2017, vegetables were sold to Café Carmen at The Ohio State ATI. 3. Surplus vegetables from Mellinger Farm were donated to local food banks and the Salvation Army. 4. Value added Mellinger Farm products were on display during the field day. 5. Harvested naked oats were converted to chicken feed each year. 6. Pressed sunflower oil quality analysis was conducted.

## OBJECTIVES

- Establish diversification scenarios in designed experiments.
- Financial evaluation of ecosystem services based on yield and yield impacts.
- Document or estimate cost of diversification and required capital during early stages of diversification.

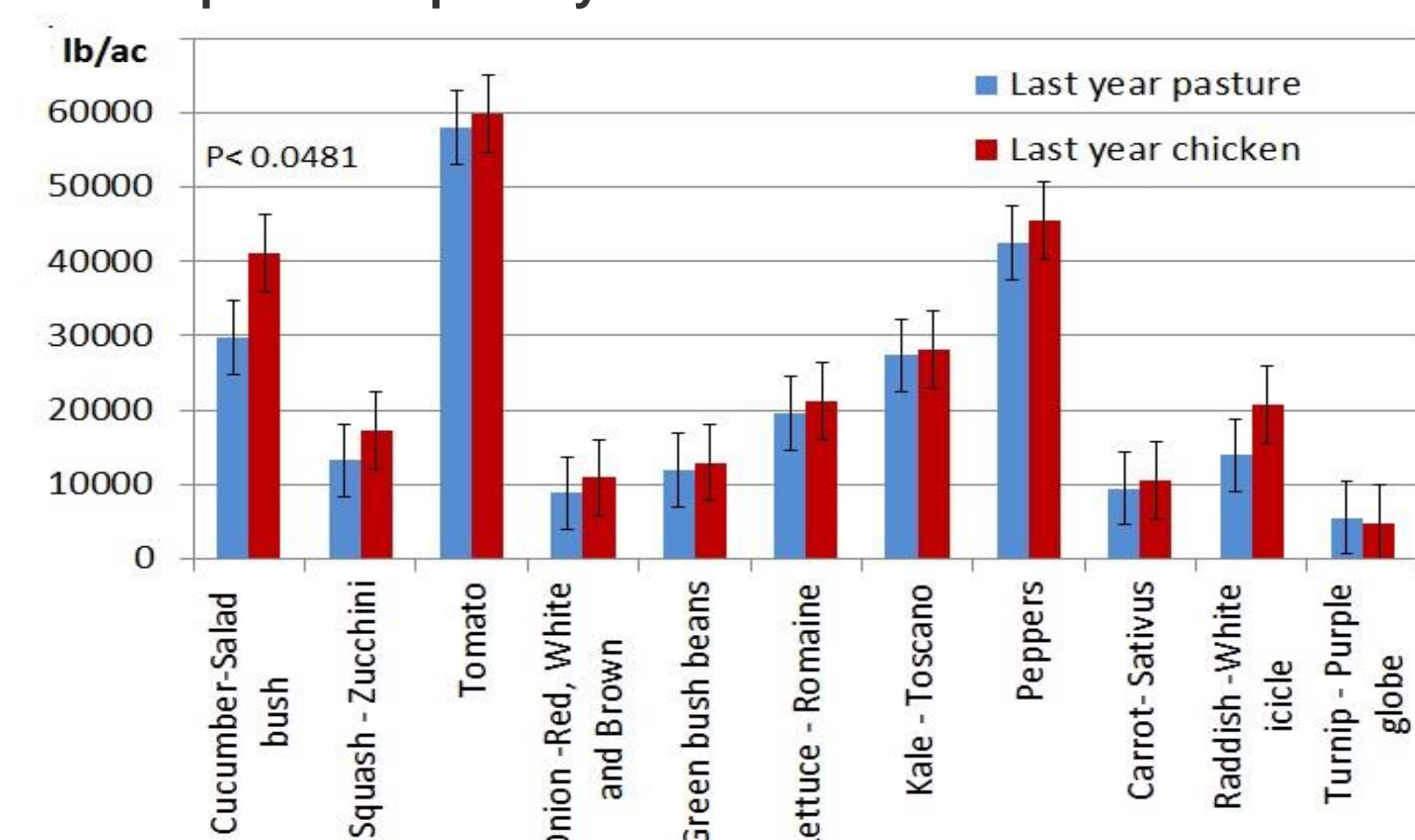
## METHODS

- Four replicates of five plot treatments were established. Three years of diverse pasture plots were established in rotation with naked oats and sunflower. Half of the 3rd year pasture plots were planted with vegetables, crossed with half of the 1st and 2nd year pasture plots that were grazed by pastured broiler chickens, for a split-split plot design.
- Yields were recorded on marketable vegetables, sunflower and oats and price data were assigned based on USDA and ERS sources. Sunflower seeds were pressed and the oil was rated for quality.
- Forage biomass in pasture plots and forage removal by pastured poultry were measured with a Rising Plate Meter.
- Pasture plant species in the pasture plots, as well as arthropods and other invertebrates in all plots, were sampled three times during the growing season and Shannon diversity indices were calculated.

- Pasture raised poultry production was measured in terms of yield per acre.
- All inputs were recorded for each of the production and value added activities.

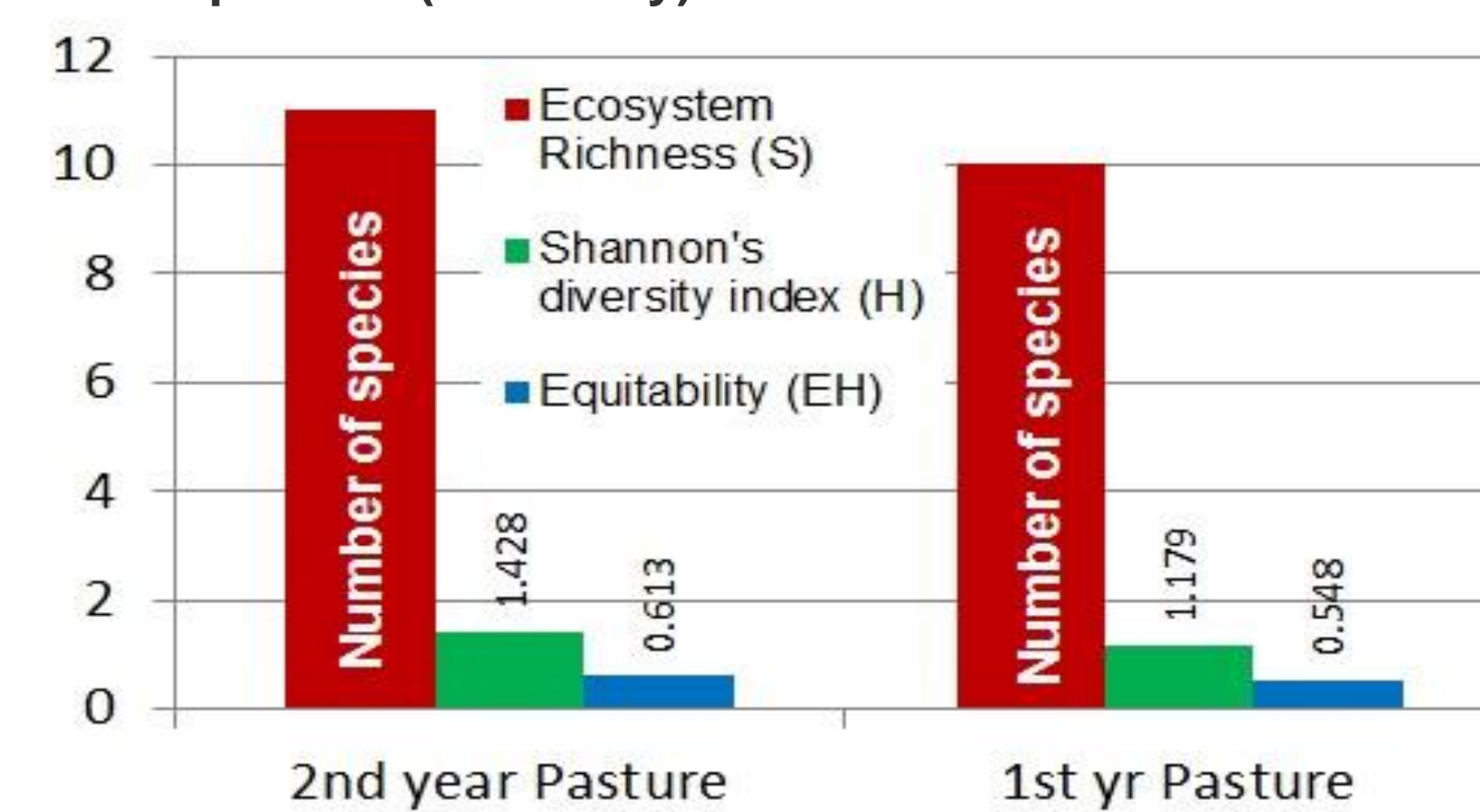
## RESULTS

Fig 1: Per acre yield comparison of the effects of producing vegetables with and without one previous year of pastured poultry.



Vegetables grown after pastured poultry, generally had higher average per acre yield compared to vegetables following pasture only, although the differences were significant only for cucumber (Fig 1).

Fig 2: Pasture species diversity in second year pasture plots (2016 and 2017) compared with first year pasture (2017 only).



Pasture species diversity was significantly higher (S and H- $p=0.02$ ), based on the Shannon diversity index, in 2nd year pasture plots than 1st year (Fig 2).

Table 1: Mellinger poultry yield comparison between 2016 and 2017. The birds were hatched earlier and left on pasture for 1 week longer during 2017 than 2016.

	2016	2017	% increase
Total number of birds	200	200	
Total Frozen wt (lb)	494.19	844.42	70.9
Mean Frozen wt (lb)	2.79	4.3	54.1
Per lb value - \$	\$3.00	\$3.60	20
Total value - \$	\$1,496.85	\$3,039.91	103.1

Arthropod and invertebrate abundance recorded on 2nd year pasture plots was greater than on 1st year pasture plots. Ground beetles, leaf hoppers, slugs and mites were all significantly more abundant in 2nd year than 1st year pasture ( $p>0.0001$ ).

Soil quality, measure by Microbial protein, Respiration and Permanganate-oxidizable C (POXC) did not differ between 1st and 2nd year pasture plots.

## CONCLUSIONS & FUTURE DIRECTIONS

Improved yield and increased species diversity suggest that ecosystem services are beginning to accrue in first year after diversification. Vegetable production was profitable in 2017 without the use of any off-farm inputs other than tillage and fencing.

Increased arthropod and species diversity on 2nd year pasture plots demonstrates the importance of longer term pasture in a diversified rotation.

We expect the impact of ecosystem services to be greater over time in terms of measurable parameters such as yield, soil health, arthropod and pasture diversity. As a result, we expect the reduction of off-farm inputs like fertilizer and pesticides to increase profitability over time.

Off-farm research and education in this project by colleagues Klaiber, Kumarappan, Mariola, Moledina focuses on examining market opportunities for diversified farms and the decisions made by farmers who have recently chosen to diversify small and mid-sized farms in Ohio.

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