

**Paul C. And Edna H. Warner Endowment Fund for Sustainable Agriculture  
Report Form**

**Improving the productivity and quality of woodland pawpaw production  
in Ohio**

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**Summary:** We are working with pawpaw producers in Ohio to elucidate key factors affecting woodland pawpaw fruit productivity and quality. Key objectives are: i) characterizing fruit production and quality in relation to the structure and environmental conditions in pawpaw patches; and ii) implementing an active-learning experiment to manipulate patch structures to improve production.

**What was done?** Work on this project formally began in September 2016 by arrangement with the funders (see attached e-mail) and will continue until August 2017. This delay in the start of the project was necessitated by the need to capture the spring pawpaw flowering season in 2017 as funding was not available early enough to do this in 2016. Understanding the relationship between flowering effort and final fruit production is a key aspect of the project.

In early summer 2016 we completed multiple site scoping visits with our collaborating producers (Integration Acres, Foxpaw Farm) to select plot locations that represented a gradient of woodland stand structures and levels of historical management intervention. We established five plots at each farm and in addition selected seventeen monitoring locations at sites owned by OSU. These locations include six plots at Waterman Farm, six plots at the Olentangy River Wetland Research Park and five plots at OSU Piketon.

All plots were monitored for fruit production in September 2016 following common monitoring procedures outlined in the proposal. Recording of pawpaw stem density has been completed in more than half the plots and woodland canopy and shrub-layer structure (indicative of light availability and resource competition) has been recorded for all plots at Waterman Farm and the Wetland Research Park.

The timeline for remaining data collection is shown in Table 1. No expenses were charged in 2016 – funds will be used in 2017 to hire part-time field technician.

**Table 1:** Timeline for remaining research activities

<b>Activity</b>	<b>Winter 2017</b>	<b>Spring 2017</b>	<b>Summer 2017</b>	<b>Autumn 2017</b>
Plot structure inventory				
Record flowering effort				
Record initial fruit set				
Record final fruit production				
Assess fruit quality				
Data analysis and final report				

### What were the results?

Early results are still being collated and processed. Data collated and entered thus far demonstrate considerable variation in the productivity of wild pawpaw patches (Table 2). Our results suggest that light availability is a critical control on fruit set. There was a difference of two orders of magnitude in fruit production between open-grown patches and those under a woodland canopy. Further qualitative analysis suggests this may partially be an effect of patch/average stem age but the results are clearly dramatic and consistent across multiple sites. The effects of intra-specific competition (related to pawpaw stem density) was not obvious though this may interact with light availability. Further monitoring and data analysis will help reveal trends in productivity with increasing levels of light availability as well as the effects of stand structure and edaphic conditions.

**Table 2:** Results of pawpaw patch productivity in 2016 (for data currently entered and processed). Fruit clusters refers to the number of flowers that showed successful fruit set (pawpaws produce clusters of 1-many fruit from a single pollinated flower). Conditions refers to whether the patch was open-grown (Open) or under a woodland canopy (Closed)

Site	Plot ID	Pawpaw stems	Fruit clusters	Total fruit	Fruit/cluster	Fruit/stem	Conditions
Fowpaw	R15	25	149	426	2.9	17.0	Open
Fowpaw	R1	-	0	0	-	0	Closed
Fowpaw	R4	101	1	1	1	< 0.1	Closed
Fowpaw	R.riv1	55	7	13	1.9	0.2	Closed
Fowpaw	R.riv2	74	7	12	1.7	0.2	Closed
Piketon	P1	-	12	32	2.7	-	Closed
Integration Acres	C1	99	1023	2669	2.6	27.0	Open

### How have the results contributed or will they contribute sustainable agriculture?

This information will allow managers to plan interventions in patch and stand structure and identify the benefits of fertilizer application.

Early results from an associated pilot project were presented at the IV International Pawpaw Conference (Frankfort, KY). There was considerable interest from both commercial and amateur growers and enthusiasts. Contact was made with a number of potential new collaborators and a range of ideas for the active learning experiment identified. These included thinning of canopy and shrub-layer competition and grafting commercial varieties, or different wild genotypes, into woodland patches to improve genetic diversity, pollination success and fruit production.