



Michigan Blueberry Grower Survey Report



Photo: Emily May

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Survey Overview

Michigan's blueberries depend on crop pollinators, which can include managed honey bees, managed bumble bees, and over 60 species of wild bees. The combined use of different pollinator species, habitat augmentation, and farm management practices to provide reliable and economical crop pollination is called Integrated Crop Pollination (ICP). In order to better understand the pollination strategies and information sources that growers currently use and the perceived benefits and challenges associated with “pollinator friendly” management practices, we conducted a grower survey in collaboration with the National Agricultural Statistics Service. In 2014-15, we surveyed 240 blueberry growers in five counties in southwest Michigan: Berrien, Muskegon, Allegan, Ottawa, and Van Buren. This survey report summarizes growers' practices, management priorities, and key information sources related to crop pollination.



Photo: Keith Mason

Michigan Blueberry Grower Survey Highlights:

Information sources: Michigan blueberry growers get information on crop pollination from a variety of sources. Growers reported that beekeepers, other growers, and Michigan State University Extension were the primary groups they communicated with about pollination management. Personal relationships provide key support for learning about pollination management, in addition to personal experience and written materials – especially extension publications.

Pollination Goals: Michigan blueberry growers' most important goal for crop pollination was achieving consistent, reliable crop pollination. It may, therefore, be useful to frame grower-oriented communication about pollinator friendly farming practices in terms of this goal.

Managed pollinators: The majority of Michigan blueberry growers (71%) reported buying or renting managed bees, with most growers using managed honey bees. Some growers also used combinations of honey bees and wild bees or managed bumble bees, or managed bumble bees alone. The average honey bee stocking rate for 2014 was 2 hives per acre and growers paid $\$52.30 \pm \1.30 per hive. Growers with large farms were more likely to buy or rent bees than small growers.

Attracting diverse pollinators: In addition to renting or buying honey bees, growers reported using practices that provided floral and nesting resources for pollinators (e.g. maintaining natural habitat, using cover crops, and leaving areas of reduced tillage—which can help support nesting habitat). Practices to attract diverse pollinators—including planting flowering cover crops, planting wildflowers along field edges, leaving fallows, and retaining natural habitat—were thought to improve crop pollination. However, weeds, pests, and costs were reported as concerns. Addressing these benefits and concerns may be useful to support growers' adoption of practices to attract diverse pollinators. For example, benefits associated with increased pollination were recently documented; Michigan State University researchers found that when growers added wildflower plantings next to Bluecrop fields, over time, there were more wild bees visiting blueberry flowers, leading to higher crop yields.

Pesticide management: There is widespread use of pest management practices designed to minimize impacts on bees, including modifying the timing of pesticide and fungicide applications to minimize impacts on bees and making an effort to choose active ingredients that have the least impact on bees. This suggests that pesticide impact messages have been highly visible; extension may reinforce this message and recognize success of widespread adoption while emphasizing additional practices to minimize risk to bees.

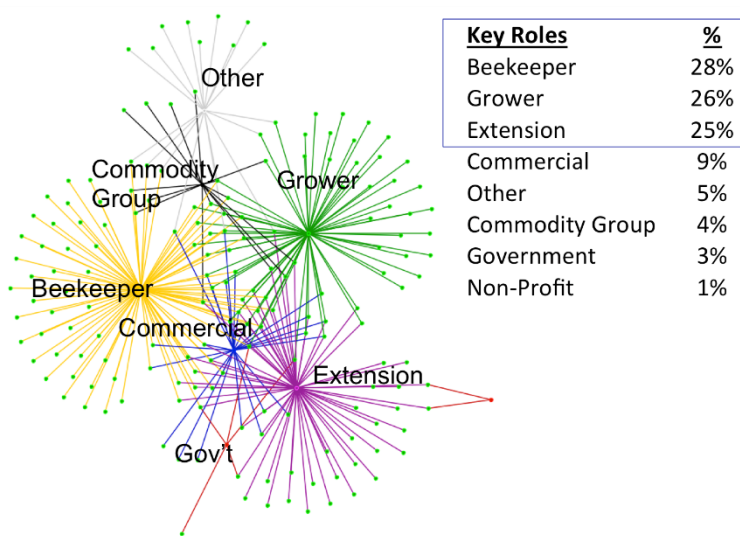


1. Communication networks & for pollination management

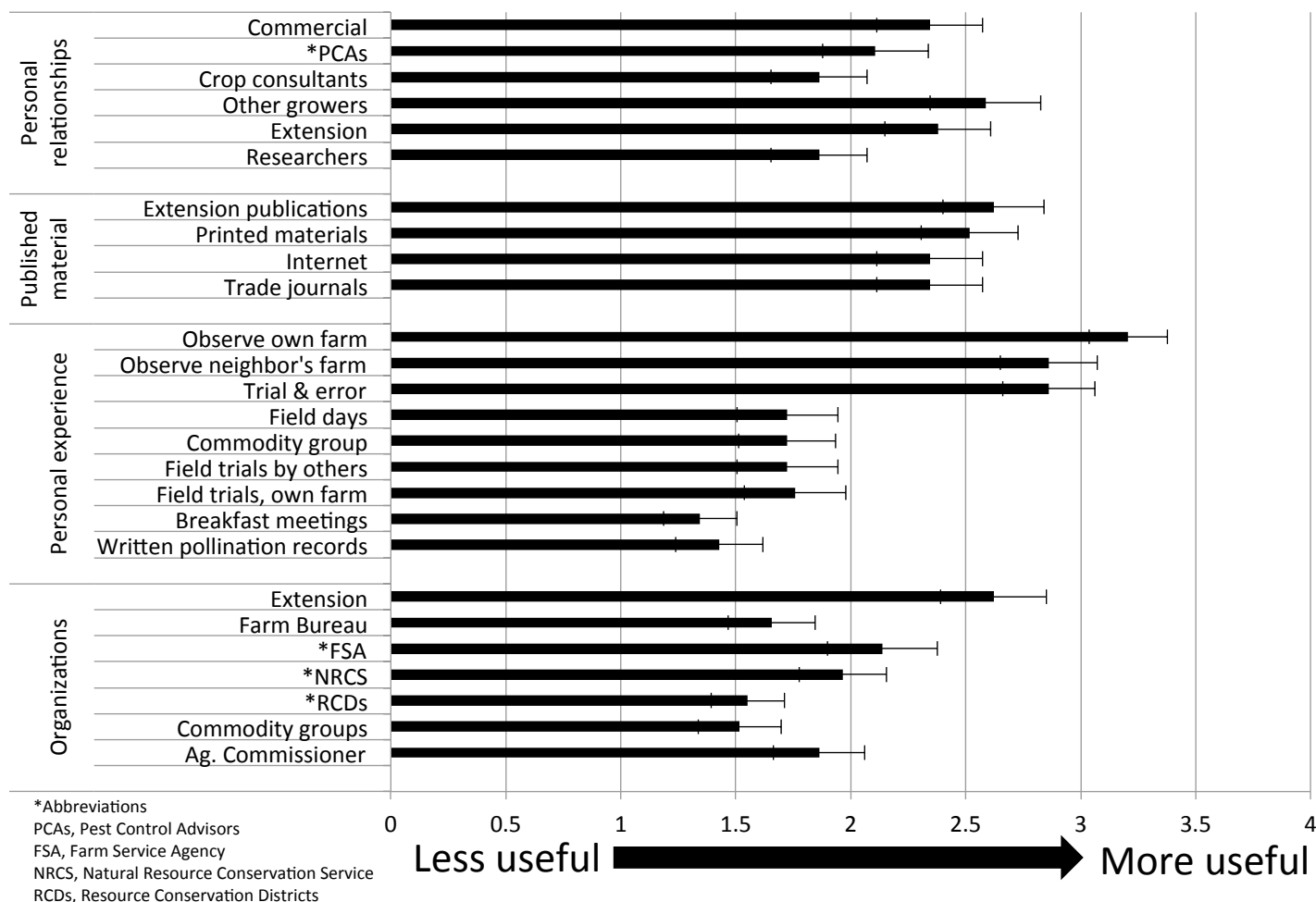
We wanted to understand how growers share information about pollination management. Growers reported on the most important people with whom they communicate about pollinators and pollinator management, and the type of job or role their contacts have. The results are presented below, with each dot representing a responding grower and the roles of their contacts grouped together by color.

Beekeepers were an important source of information, represented in 28% of growers' networks. Responses also highlight the importance of **grower-to-grower communication**, which was reflected in 26% of growers' networks. Information from **Extension** was also critical, represented in 25% of grower networks.

Blueberry growers also rated the usefulness of information sources on pollination management (scale 0-4, "never used" to "most useful"), graphed below. Personal relationships provide key support for learning about pollination management through personal experience and observation of farm conditions, extension workshops and literature, and organizations.



N = 240, MI blueberry growers. 2014 data, Network analysis by K. Garbach and G. Morgan



*Abbreviations

PCAs, Pest Control Advisors

FSA, Farm Service Agency

NRCS, Natural Resource Conservation Service

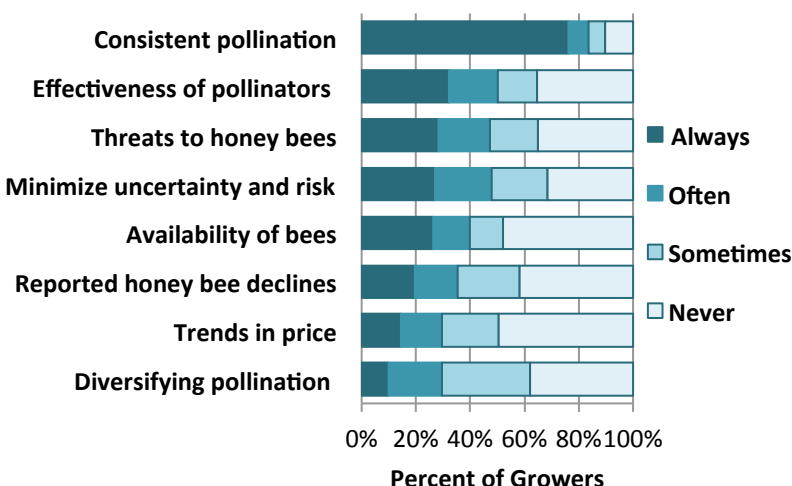
RCDs, Resource Conservation Districts



2. Pollination management priorities

We investigated pollination management priorities for blueberry growers. Respondents categorized a list of priorities as *Always*, *Often*, *Sometimes*, or *Never* a priority in pollination management decisions (Figure 1).

Figure 1: Pollination management priorities, MI blueberry growers



Consistent, reliable crop pollination is a top management priority for blueberry growers. We found that growers on large (≥ 180 acres) and medium sized (10-179 acres) farms were significantly more likely to rate this as *Always* a management priority than growers with small farms (9 acres or less).

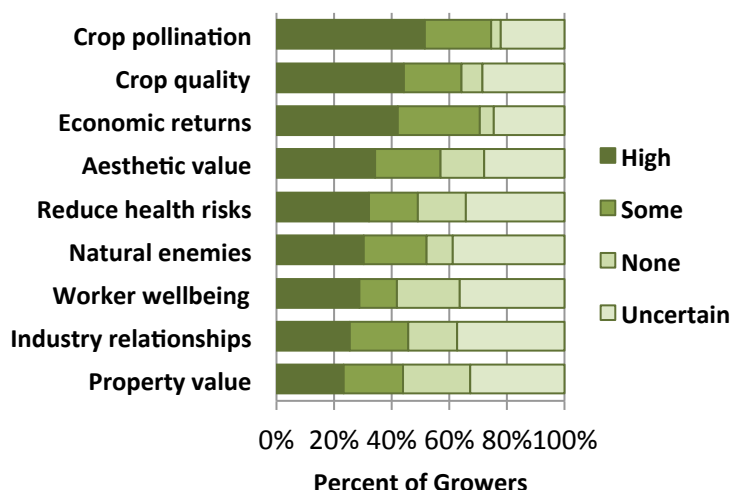
Growers on larger farms tended to report more often than smaller growers that availability of managed pollinators for rental or purchase, and effectiveness of pollinator species, were always or often a management priority. On average, growers with large farms ranked effectiveness of pollinator species as a higher priority than growers with small farms (2.6 vs. 1.8 on a 4-point priority scale for large and small growers, respectively).

Taken together, these data suggest three tiers of management priorities for blueberry growers, with consistent, reliable crop pollination as a clear, top priority. A second tier of considerations includes effectiveness of pollinator species, threats to honeybee populations, minimizing risk and uncertainty, and availability of managed pollinators. Reported declines in honeybee populations, trends in price, and diversifying pollination strategies were the lowest rated management priorities.

3. Potential benefits & concerns of practices to attract diverse pollinators

Growers were asked about potential benefits and concerns of practices to attract diverse pollinators (e.g., floral plantings, leaving fallows, establishing pollinator habitat). Respondents ranked benefits and concerns as *High*, *Some*, *None*, or *Uncertain* (Figure 2a, Benefits; Figure 2b, Concerns).

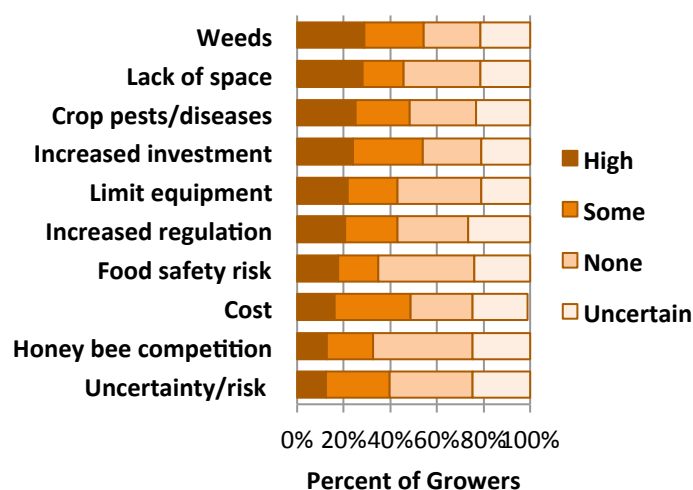
Figure 2a: Benefits of practices to attract & retain diverse pollinators



Benefits that directly support on-farm economic productivity were rated most highly, including increasing crop pollination, increasing specialty crop quality, and increasing economic returns to growers (Figure 2a).



Figure 2b: Concerns of practices to attract & retain diverse pollinators



The top rated concerns were weeds, lack of space, increased risk of crop pests and diseases, and increased farm investment, including additional equipment, labor, and paperwork (Figure 2b).

4. Pollinator management findings

Buying or renting managed bees

Two-thirds of blueberry growers (71%) reported buying or renting bees annually (Table 1), with 29% not buying or renting managed pollinators. Managed bees used in Michigan blueberry include honey bees, the most common managed pollinator, as well as commercial bumble bees. Among blueberry growers that do not buy or rent pollinators, most rely on wild pollinators (70%), with some growers relying on bees sourced by neighbors (11%). Some growers also use bees that they own (8%), or rely on other strategies (<5%).

Table 1. Pollinator rental & purchase

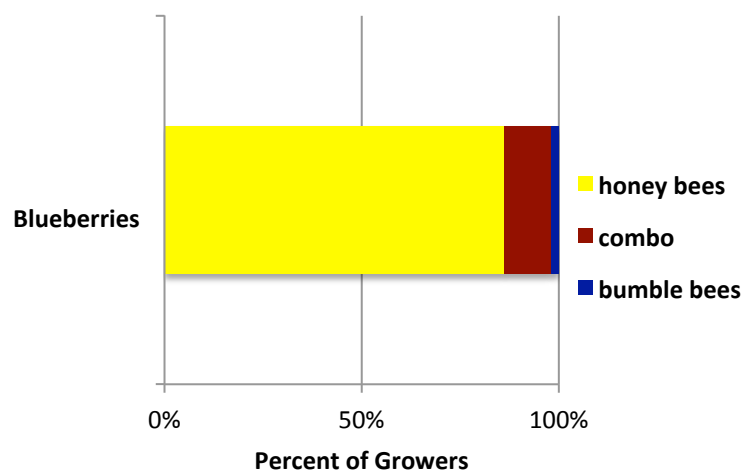
Crop by county	n	Buy/Rent	None
Blueberries	240	71%	29%
Allegan	35	83%	17%
Berrien	27	52%	48%
Muskegon	18	61%	39%
Ottawa	56	89%	11%
Van Buren	104	63%	37%

Blueberry growers reported buying or renting pollinators more frequently than growers of apples or cherries. Growers on larger farms were more likely to report buying or renting bees than smaller growers.

Trends in buying/renting bees by county

Allegan and Ottawa counties had a higher proportion of blueberry growers that buy/rent pollinators (83% and 89%, respectively) than other surveyed counties. This may be due in part to trends in larger, commercial operations in these counties; farm sizes have increased 13% in Allegan and 16% in Ottawa Counties between 2007 and 2012, while the number of farms and farmed acres has decreased.¹

Figure 3. Proportion of MI Blueberry growers using managed pollinators



Main pollinators used in blueberries

Blueberry growers primarily use honey bees (86%), with only 2% of growers reporting bumble bees as their primary pollinator; 12% reported using a combination of bees (Figure 3). These combinations were honey bees plus bumble bees, or honey bees and wild bees. Over sixty species of wild bees are known to visit Michigan blueberry flowers, with several wild species exhibiting high fidelity and/or abundance on blueberry flowers.

1. NASS 2012, http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Michigan/cp99026.pdf



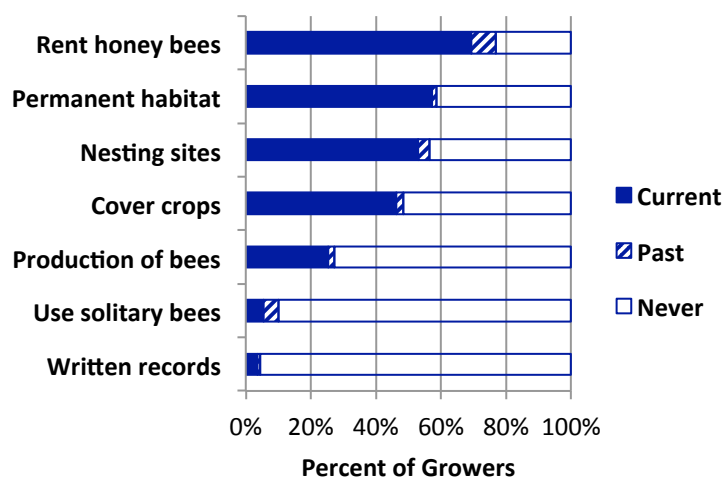
Perceptions & rental trends

We asked blueberry growers whether they expected pollinator rental/purchase prices to change in the future. Responses reflected anticipated change (53%) or uncertainty (37%), with only 10% of growers expecting prices to stay the same. All growers that expected pollinator prices to change in the future indicated that prices are expected to increase. This reflects the trend of increased rental prices nationwide.² The average price per honey bee hive was \$52.30 ± 1.30 (± se), with growers arranging contracts on average 10 months in advance.³

5. Pollinator & pest management

We asked growers about their current pollinator and pest management practices, those that were tried in the past but discontinued, and practices that had never been used (Figures 2, 3: *Current* practices in solid bars, *Past* practices in striped bars, practices *Never* used in open bars; frequencies across categories sum to 100 for each practice).

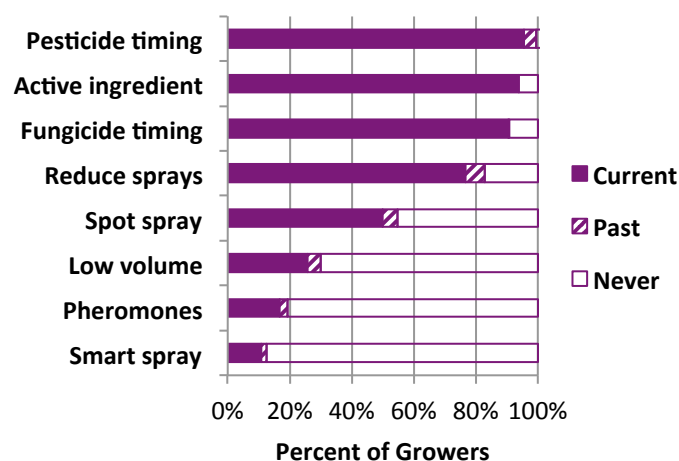
Figure 4: MI blueberry growers' pollination management practices



Honey bees: Renting managed honeybees is the most frequently reported current management practice (65% of blueberry growers).

Pollinator habitat: About half of growers report using habitat to attract and retain diverse pollinators: 48% of growers encouraged pollinators using temporary cover crops, 51% report using practices that encourage bee nesting (e.g., installing bee boxes or leaving areas of reduced tillage), and 60% of growers report encouraging pollinators with areas of permanent habitat. This refers primarily to retaining existing habitat, such as maintaining wooded areas, old fields, and other semi-natural areas adjacent to cropped areas, rather than actively creating or restoring habitat.

Figure 4: MI blueberry growers' pest management practices



Nearly all Michigan blueberry growers reported timing pesticide application to minimize impacts on bees (96% of growers, current practice), making an effort to choose active ingredients that have the least impact on bees (94% of growers), and timing fungicide application to minimize impact on bees (90% of growers). Widespread use of these practices may be because minimizing pesticide risk to bees has been a highly visible management issue that has been promoted through extension, beekeepers and suppliers, and commodity groups.

2. USDA ERS, 2012 http://www.ers.usda.gov/media/1679173/special-article-september_-pollinator-service-market-4-.pdf

3. Rental rates reported in the ICP survey are within range of a recent commercial beekeeper survey and referenced by MSU Extension, Philips 2014, http://msue.anr.msu.edu/news/current_honey_bee_stocking_information_and_an_introduction_to_commercial_bu



6. Overview of Michigan blueberry farms

Michigan farmers reported an average farm size of 182 acres, with 41 acres in blueberry. This acreage is representative of average farm sizes for the counties surveyed (Table 2).

Table 2. ICP survey sample summary

County	Ag. Census 2012	ICP Survey 2014-15		
	Farm size <i>acres</i>	Farm size <i>acres</i>	Blueberry <i>acres</i>	Number of farms surveyed
Allegan	194	126.5	40.3	35
Berrien	147	152.6	7.6	27
Muskegon	144	135.8	65.1	18
Ottawa	137	204.7	68.5	56
Van Buren	157	204.2	43.8	104
Average	155.8	182.4	41.0	Total = 240

Integrated Crop Pollination Project

Integrated Crop Pollination (ICP) is the combined use of different pollinator species, habitat augmentation, and farm management practices to provide reliable and economical crop pollination.

For a full copy of the survey, visit:

http://icpbees.org/wp-content/uploads/2016/03/ICP_Survey_11-1-2014.pdf

For more information, visit our website at:

www.projecticp.org or find us on Facebook.

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Overview of blueberry pollination in Michigan

Michigan grows over thirty varieties of blueberries. While many growers rent honey bees to ensure pollination, some growers receive all of their pollination from wild, native bees. Smaller MI blueberry fields surrounded by natural habitat receive high visitation from wild bees, while larger fields isolated from natural habitat receive most of their flower visitation from managed honey bees. The most important wild bee species contributing to blueberry pollination include bumble bees (*Bombus* spp.), miner bees (*Andrena* spp.), and sweat bees (Halictidae). Michigan State University researchers found that when growers added wildflower plantings next to Bluecrop fields, over time, there were more wild bees visiting blueberry flowers in the adjacent field, leading to higher crop yields.

Examples of different types of bees that are important to Michigan blueberry pollination



Honey bee (*Apis mellifera*)



Bumble bee (*Bombus impatiens*)



Miner bee (*Andrena carolina*)



Green sweat bee (*Augochlora pura*)