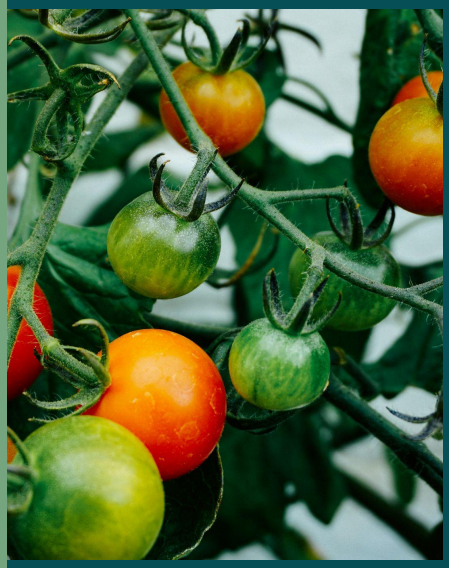
Beginning Farmer Resource & Decision-Making Guide

DECEMBER 2025













Scan QR Code for Resource Website

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES

RESOURCE GUIDE

Authors & Contributors

Katje Armentrout, former Community Food Systems Educator, Michigan State University

Mariel Borgman, Community Food Systems Educator, Michigan State University Extension

Katie Brandt, MSU Organic Farmer Training Program, Michigan State University Extension

Lindsay Brown, Tree Fruit Research Technologist, Penn State University

Madelyn Celovsky, Conservation Agronomist Educator, Michigan State University Extension

Christine Charles, Field Crops and Regenerative Agriculture Educator, Michigan State University Extension

Corey Clark, Farm Business Management Educator, Michigan State University Extension

Florencia Colella, Farm Business Management Educator, Michigan State University Extension

Teresa Crook, Field Crops Educator, Michigan State University Extension

Christina Curell, Cover Crop and Soil Health Educator, Michigan State University Extension

Jill Dohner, Director of MIFarmLink

Younsuk Dong, Irrigation Specialist, Michigan State University

Naim Edwards, Director of MSU Extension-Detroit Partnership for Food, Learning, and Innovation

Jenna Falor, Field Crops Educator, Michigan State University Extension

Ehsan Ghane, Associate Professor and Extension Specialist, Michigan State University

Angie Gradiz, Agriculture Water Use Efficiency Educator, Michigan State University Extension

Ana Heck, Apiculture Educator, Michigan State University Extension

Jeremy Jubenville, Floriculture and Greenhouse Educator, Michigan State University Extension

Barslund Judd, Consumer Horticulture Educator, Michigan State University Extension

Brenden Kelley, Water Use Efficiency and Irrigation Educator, Michigan State University Extension

Lyndon Kelley, Water Management and Irrigation Educator, Michigan State University Extension

Jonathan LaPorte, Farm Business Management Educator, Michigan State University Extension (*Project Lead*)

Emily Lavely, Tree Fruit Educator, Michigan State University Extension

Erin Lauwers, Integrated Pest Management Educator, Michigan State University Extension

Salta Mambetova, Vegetable Educator, Michigan State University Extension

Michael Metzger, Small Ruminant Educator, Michigan State University Extension

Laurel Harduar Morano, Associate Professor, Michigan State University

Vicki Morrone, Academic Specialist, Michigan State University

Benjamin Phillips, Vegetable Specialist, Michigan State University Extension

Derek Plotkowski, Fruit Educator, Michigan State University Extension

Zoe Post, State Beginning Farmer and Rancher Contact, United States Department of Agriculture (*Project Lead*)

Katie Ockert, Community, Food, and Environment Educator, Michigan State University Extension

Jamie Rahrig, Director of Food and Farm Business Assistance, MSU Center for Regional Food Systems

Nicolle Ritchie, Field Crops Agronomy Educator, Michigan State University Extension

Zachariah Rutledge, Assistant Professor, Michigan State University

Cheyenne Sloan, Blueberry and Small Fruit Educator, Michigan State University Extension

Samantha Stokes, former Food & Farm Business Outreach Specialist, Michigan State University

Aimee Swenson, former State Beginning Farmer, Rancher, Veteran Coordinator, United States Department of Agriculture

Kable Thurlow, Beef & Grazing Educator, Michigan State University Extension

Phil Tocco, Food Safety Educator, Michigan State University Extension

Steve Whittington, Field Crops Educator, Michigan State University Extension

Kendra Wills, Product Center Innovation Counselor, Michigan State University Extension

Kim Williams-Guillén, TOPP Technician, Washtenaw County Conservation District

Casey Zangaro, Swine Educator, Michigan State University Extension

Sarah Zeiler, Environmental Management Educator, Michigan State University Extension

Garrett Ziegler, Community Food Systems Educator, Michigan State University Extension

Acknowledgements

SPECIAL THANKS

Julie Ford, District 13 Secretary, Michigan State University Extension (*Guide Reviewer*)

Cheryl Hall, Lapeer County Secretary, Michigan State University Extension (*Guide Reviewer*)

Angel Smith, former Osceola County Secretary, Michigan State University Extension (*Guide Reviewer*)

Bailey Swanson, Emmet County Secretary, Michigan State University Extension (*Guide Reviewer*)

Alison Buskirk, Digital Media Designer, Michigan State University Extension (*Guide Designer*)

PHOTO CREDITS

Photos for the guide were provided by authors and contributors or obtained from Pexels.com, Pixabay.com or iStock.com. All other photo sources are acknowledged in captions, where appropriate.

Table of Contents

BEES & LIVESTOCK

Beekeeping 7
Behavior and Welfare 25
Feed Handling & Storage 37
General Housing 46
Health Management & Disease 57
Manure & Mortality 69
Procuring Animals 80
Recordkeeping 89
Appendix (Resources & Partners) 102

EQUIPMENT

Plastic and Drip-Layers 107
Sprayers and Spreaders 116
Tillage Equipment 125
Transplanters/Seeders 138

ORGANIC FARMING

Introduction to Organics 151

PLANTS

Nutrient Management 192
Pest Management 208
Seeds 242
Transplants & Grafting 260

SOIL HEALTH

Introduction to Soil Health 273

WATER MANAGEMENT

Drainage 307
Drip Irrigation 316
Pivot Irrigation 328

GENERAL TOPICS

Business Planning 343
Environmental Risk Management 379
Farm Labor 390
Financing 411
Land Access 427
Marketing 453
Risk Management 522
Setting Up a Business 543
Tax Management 570
Urban Farming 607

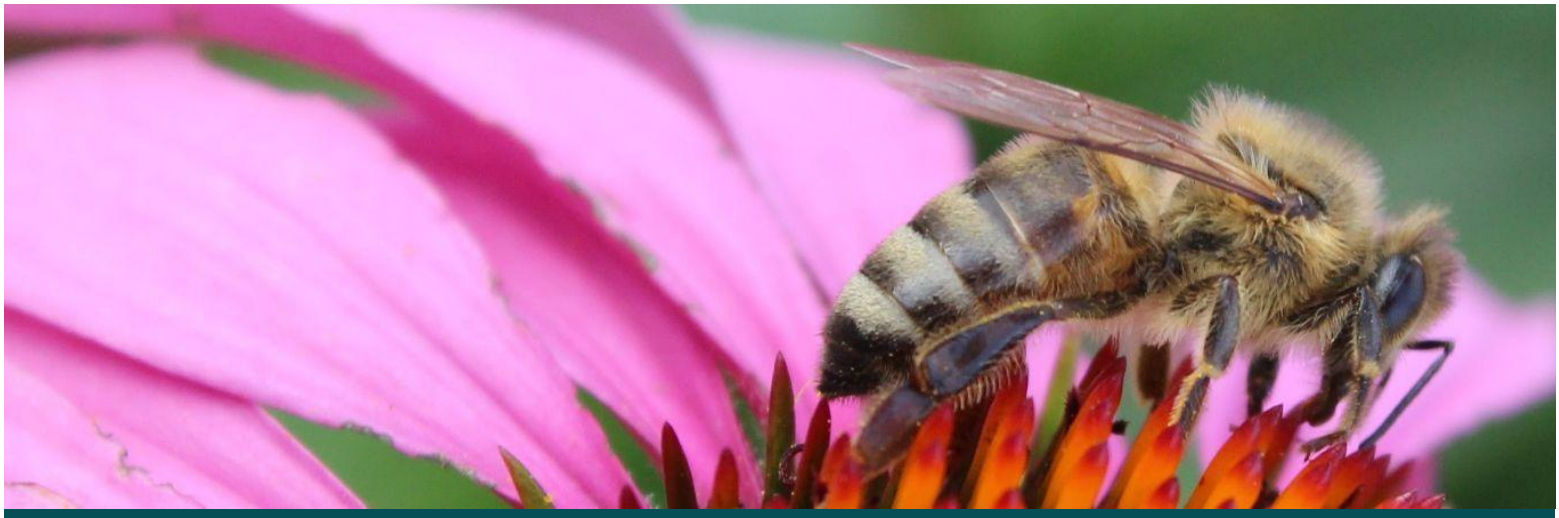
.

INDEX

Index 624

LIVESTOCK

Beekeeping



AUTHORS & INSTITUTIONS

Ana Heck, Apiculture Educator, Michigan State University Extension

SECTIONS

Section 1: Learn and Gain Experience
Section 2: Bee Health

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Many people are interested in getting started with beekeeping as a way to spend time outdoors, participate in agriculture, dive into a new hobby or connect with a local community. However, before you buy honey bees and hive equipment, take time to learn about beekeeping and connect with a local beekeeping community.



While beekeeping can be fascinating and rewarding, it also has a steep learning curve. It's common for new beekeepers to struggle to keep colonies alive and healthy. It's also common for new beekeepers to underestimate the time, physical demands, and financial costs of getting started in beekeeping.



How To Get Started

The first and most important step in beekeeping is education. Take time to read, attend courses, gain hands-on experience, and get involved in beekeeping associations. Developing a solid understanding of honey bee biology and clarifying your purpose will help set you up for success.

If you decide to pursue beekeeping, you should consider suitable apiary locations, become familiar with Michigan and local regulations related to beekeeping, and address any potential concerns with neighbors.

With your budget in place, you'll be ready to order honey bees, hives, tools, and protective clothing. Be sure to have your equipment ready before your bees arrive.

After installing your new colonies, you will need to regularly inspect and care for them. Monitor colony health, address issues promptly, and continue learning through reading, conferences, and connecting with other beekeepers.





SECTION 1

Learn and Gain Experience

Primary Considerations

Knowledge and hands-on experience are essential for fostering and maintaining healthy, thriving honey bee colonies. As you learn and gain experience, you'll develop skills in inspecting honey bee colonies, applying best practices to keep colonies strong and troubleshooting common challenges. With time, you'll also learn how to treat colony health issues and enjoy the reward of harvesting honey while keeping your bees healthy and productive. Below are several resources to support you as you begin your beekeeping journey.

Is Beekeeping Right for Me? (https://www.canr.msu.edu/courses/msu-is-beekeeping-right-for-me) is a free online course from Michigan State University Extension that will guide you through the many considerations of getting started with beekeeping. This online course introduces you to beekeeping and suggests ways that you can help honey bees and all pollinators. It also covers the physical, time, and financial demands of beekeeping, so that you can make an informed decision before getting started. Testimonials from real beekeepers, past and current, are included in the course for you to learn from their experiences. The course is full of resources for you to support pollinator health, decide if beekeeping is a good fit for you, and identify steps to get started with beekeeping.

What we wished we'd known in the bee-gining (https://www.canr.msu.edu/news/what-we-wished-we-d-known-in-the-bee-gining) is an online article describing what many beekeepers share they would have liked to know when starting beekeeping.



Process for Getting Started

Learn about beekeeping before you buy bees and equipment.

Join a local beekeeping community

Michigan has a statewide beekeeping organization, the **Michigan Beekeepers Association**, and is home to about 30 **local beekeeping clubs**. While each club is different, many offer monthly meetings with educational presentations and opportunities to network.

Check out educational opportunities from Michigan State University Extension

- Each year, MSU provides webinars, workshops and presentations to beekeeper audiences, which are listed on **MSU Extension's page of upcoming beekeeping & pollinators events.**
- You can **sign up for MSU Extension's Beekeeping & Pollinators email digest** to receive emails about upcoming events and recent articles.
- You can visit **MSU Extension's Beekeeping & Pollinators videos** and **MSU Beekeeping's YouTube channel** to see videos and recordings of past webinars.
- MSU Extension posts online articles and other resources for beekeepers on the **MSU Extension beekeeping website.**
- Key resources are listed in the online article, **Apiculture programs and resources from Michigan State University Extension.**

Attend beekeeping schools and conferences



MSU Extension collaborates with the **Michigan Beekeepers Association** (MBA) to plan and host beekeeping conferences in the spring and fall. These conferences are attended by hundreds of beekeepers statewide, and they include speakers on a variety of topics ranging from honey bee health to using hive products. MBA sends emails to its contact list with newsletters and other announcements. **MBA members** are automatically added to the email list, and non-members who do not already receive emails from MBA can **sign up for MBA's email list.**

Many **local beekeeping clubs** also host beekeeping schools, conferences and classes. Some of these educational events are intended for people getting started with beekeeping, while others also offer information on intermediate and advanced beekeeping topics.

Buy a veil and learn from other beekeepers

MSU strongly encourages people who are interested in beekeeping to spend their first year learning. Purchase a beekeeping veil or suit, join your local club to meet area beekeepers and spend a year getting in-hive experience before purchasing your own bees. You can volunteer to help other beekeepers in their apiaries. You may also be able to get in-hive experience through a beekeeping class or in-hive workshops offered by local beekeeping clubs and university extension.

Read at least one beginning beekeeping book to understand basic honey bee biology

Honey bees are complex creatures that respond to environmental changes. In order to manage them well, you have to have a grasp of basic biology and all of the beekeeping terms and jargon. While you will continue to read and learn about bees after you become a beekeeper, you should know the basics of their care before you start.



The **Beekeeping in Northern Climates manual from the University of Minnesota Bee Lab** is an excellent resource on a beekeeping system with a proven track record for beginning beekeepers in a climate similar to that of Michigan.



SECTION 2

Bee Health

Primary Considerations

It is important to be aware of common honey bee health issues. All honey bee colonies in Michigan are expected to have parasitic varroa mites and viruses. Honey bees can also be affected by fungal and bacterial diseases and other pests.



Process for Getting Started

Learn about varroa mites

Honey bees are experiencing an epidemic of varroa mites, which are deadly, parasitic mites. Many people who start beekeeping lose most or all of their colonies to this parasite every year. Varroa mites are present in all honey bee colonies in Michigan, and they spread diseases to honey bees. One of the biggest challenges to keeping honey bees healthy is learning how to monitor and manage varroa mites, and right now, successful beekeeping requires a good pest management plan. The **Honey Bee Health Coalition's Tools for Varroa Management guide** offers a comprehensive overview of varroa mite management options.

Learn about other honey bee health topics

In addition to learning about varroa mites, it is important to learn about honey bee nutrition, diseases and other colony health issues. Many beekeeping resources are listed on the **MSU Extension Beekeeping & Pollinators website** and **Michigan Pollinator Initiative's resources** for beekeepers. Key resources include:

- **Diagnostic tools for honey bee diseases online learning module**
- **2024 European foulbrood webinar recording**
- **Diagnostic labs and services for beekeepers**
- **Honey Bee Nutrition Guide from the Honey Bee Health Coalition**

Disclaimer: For a specific list of resources in the above description, view the Recommended Resources area of this section.



BEEKEEPING

COMMON QUESTIONS

01 How much care do honey bee colonies need?

Beekeepers should plan to inspect honey bee colonies to make sure the colonies have the appropriate amount of space in the hive, have sufficient food stores, are queenright, and are healthy. The frequency of inspections depends on the time of year. In the spring when colonies are quickly building up in population and collecting lots of nectar, new beekeepers may inspect the colonies every one to two weeks. Later in the summer when the colony build up slows down, beekeepers may find they do inspections every two to three weeks. Beekeepers usually harvest surplus honey in the fall and continue with regular inspections. Colony inspections in the winter are infrequent and are usually performed just to check the colony's food stores.

02 Where can I purchase honey bees and beekeeping equipment?

Since beekeeping has a steep learning curve, it's best to learn as much as you can before you purchase bees and equipment. MSU does not endorse specific vendors, but local beekeeping clubs may provide recommendations. Beekeeping clubs may also make bulk purchases of bees and equipment, or bee club members may sell bees to each other. It is also useful to visit the vendor room at beekeeping conferences so you can handle and try on beekeeping equipment and gear.

The **Northern Bee Network** is an online platform that allows beekeepers to buy and sell honey bees. Many beekeeping clubs also connect members who are buying and selling bees. MSU has short videos that explain **options for purchasing honey bees** and how to get started with **installing package colonies** and **installing nucleus (nuc) colonies.**

03 How many honey bee colonies should I start with?

MSU recommends beekeepers begin with two or three honey bee colonies. Keeping just one colony can be difficult for the beekeeper to troubleshoot and resolve issues as they arise. Beekeepers often move brood or food frames between hives to address queen issues and other colony needs, and colonies in the same yard can be used to support each other.

New beekeepers should be aware that healthy colonies grow in population in the spring and summer. Beekeepers should be prepared to manage large honey bee colonies unless they make splits or do other hive manipulations. The **Michigan State University Beekeeping YouTube channel** has webinar recordings on managing growing colonies throughout the season and splitting on colonies.

04 How can I find a beekeeping mentor?

Traditionally, many people learned beekeeping by apprenticing with a mentor. A mentor who has years of experience successfully keeping bees alive can be a wonderful resource. Due to the large number of beginning beekeepers, however, many new beekeepers find they are not able to find a mentor. Often a good approach to working with a mentor is to offer to help the mentor in the bee yard by lifting, taking notes or whatever task needs to get done. If you aren't able to find a beekeeper mentor, you can get advice and guidance from MSU Extension programs and your local beekeeping club.

05 What are the rules and regulations for beekeeping in Michigan?

MSU helps beekeepers by consolidating beekeeping related rules, regulations and guidelines in the state in the **Michigan Beekeeping Rules and Regulations** document. In this document, you will find information related to beekeeping and the Michigan Right to Farm Act and **Generally Accepted Agricultural and Management Practices (GAAMPs)**, organic beekeeping, transporting hives to and from Michigan, honey processing rules and regulations for selling honey in Michigan, and more!

Additional resources on beekeeping rules and regulations include:

- **Rules and regulations for selling honey in Michigan**
- **Producing a Value-Added Product on the Farm: Liquid Honey**
- **Generally accepted agricultural and management practices for honey bees**
- **What to do if you suspect your honey bee colonies are harmed by pesticides**
- **When do beekeepers in Michigan need pesticide certification and licenses?**
- **EPA issues advisory for substances used to control varroa mites in beehives**



RESOURCES & PARTNERS

Necessary Resources

NEW COLONIES

- Northern Bee Network - online directory for selling and purchasing local bees (https://northernbeenetwork.org/)
- Beginning beekeeping: installing a nuc - video (https://www.youtube.com/watch?v=G2iDuLVQBfs)
- Beginning beekeeping: installing a package - video (https://www.youtube.com/watch?v=_V0UCW8mLYo)
- Hiving bees in rain and sleet - video (https://www.youtube.com/watch?v=Jm9j7ARfa3k)
- First year colonies: what to do when the bees arrive - webinar recording (https://www.youtube.com/watch?v=fbRAMhWRZ4U)

Varroa mites and honey bee diseases

- **Tools for varroa management from the Honey Bee Health Coalition - guide**
- **Diagnostic tools for honey bee diseases - online learning module** (https://pollinators.msu.edu/sites/_pollinators/rise360/diagnostic-tools-for-honey-bee-diseases/index.html#/)
- **European foulbrood office hours - webinar recording** (https://www.youtube.com/watch?v=Fr4A_bbisRI)
- **Diagnostic labs and services for beekeepers** (https://www.canr.msu.edu/news/diagnostic-labs-and-services-for-beekeepers)
- **Honey Bee Health Coalition** (https://honeybeehealthcoalition.org/)
- **Michigan honey bee veterinarians - contact list** (https://www.canr.msu.edu/news/michigan-honey-bee-veterinarians-contact-list)
- **Find a bee vet from the Honey Bee Veterinary Consortium - contact list** (https://hbvc.org/content.aspx?page_id=824&club_id=213546)

General beekeeping resources

- **Apiculture programs and resources from MSU Extension** (https://www.canr.msu.edu/news/apiculture-extension-update-from-michigan-state-university-extension)
- **Getting started with beekeeping in Michigan** (https://www.canr.msu.edu/news/getting-started-with-beekeeping-in-michigan)
- **Is Beekeeping Right for Me? - online course** (https://www.canr.msu.edu/courses/msu-is-beekeeping-right-for-me)
- **What we wished we'd known in the bee-gining** (https://www.canr.msu.edu/news/what-we-wished-we-d-known-in-the-bee-gining)
- **Ask Extension form for Michigan residents to ask beekeeping questions** (https://pollinators.msu.edu/questions/)
- **List of Michigan beekeeping clubs from Michigan Beekeepers Association** (https://www.michiganbees.org/Michigan-Bee-Clubs)
- **Beekeeping in Northern Climates Manual from the University of Minnesota Bee Lab** (https://beelab.umn.edu/manuals)
- **Honey Bee Nutrition Guide from the Honey Bee Health Coalition** (https://honeybeehealthcoalition.org/nutritionguide/)
- **Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish (ELAP) Program from the USDA Farm Service Agency** (https://www.fsa.usda.gov/resources/programs/emergency-assistance-livestock-honeybees-farm-raised-fish-elap)

Websites, email newsletter and social media

- **MSU Extension Beekeeping & Pollinators website** (https://www.canr.msu.edu/pollination/index)
- **Michigan Pollinator Initiative website** (https://pollinators.msu.edu/)
- **MSU Extension Beekeeping & Pollinators events** (http://bit.ly/MSUpollinatorevents)
- **MSU Extension Beekeeping & Pollinators email newsletter (http://bit.ly/MSUENews)**
- **MSU Extension's Beekeeping & Pollinators Videos** (https://www.canr.msu.edu/search?tag=pollinators%20and%20pollination&county=&contentTypeOption=VideoObject&siteContext=pollinators%20and%20pollination&tagUsage=&searchType=searchBar&hideHomePage=true#results)
- **Michigan State University Beekeeping YouTube channel** (https://www.youtube.com/channel/UCD7AYI-MRu_3mp3oRW1kWVw/videos)
- **Michigan State University Beekeeping Facebook page** (https://www.facebook.com/MSUHoneyBees/)
- **Michigan Pollinator Initiative Facebook page** (https://www.facebook.com/MichiganPollinatorInitiative/)

PARTNERS

- **Michigan Beekeepers Association** (https://www.michiganbees.org/)
- **Local beekeeping clubs in Michigan** (https://www.michiganbees.org/Michigan-Bee-Clubs)

LIVESTOCK

Behavior and Welfare



AUTHORS & INSTITUTIONS

Michael Metzger, Small Ruminant Educator, Michigan State University Extension

Katie Ockert, Community, Food, and Environment Educator, MSU Extension

Casey Zangaro, Swine Educator, MSU Extension

SECTIONS

Section 1: Health Management and Disease Prevention

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

The well-being and welfare of livestock is directly related to the livestock production, health, and presentation of natural behaviors. Animal well-being considers the animal's physical, mental, and emotional state. Whereas, animal welfare focuses on the physical conditions and treatment of the livestock. Producers who care for livestock must learn about, understand, and implement animal well-being and welfare practices.



Understanding the basics of livestock behavior and welfare is important. Livestock are unpredictable, never let your comfort and familiarity put you or livestock in danger. Livestock are prey animals and under duress will engage in their fight-or-flight response. Many livestock handling concepts are similar across species; this includes cattle, sheep, swine, chickens, and horses. You will learn that each animal has different needs related to handling, and it may be necessary to step away from a situation, and re-evaluate your approach to the situation.

How To Get Started

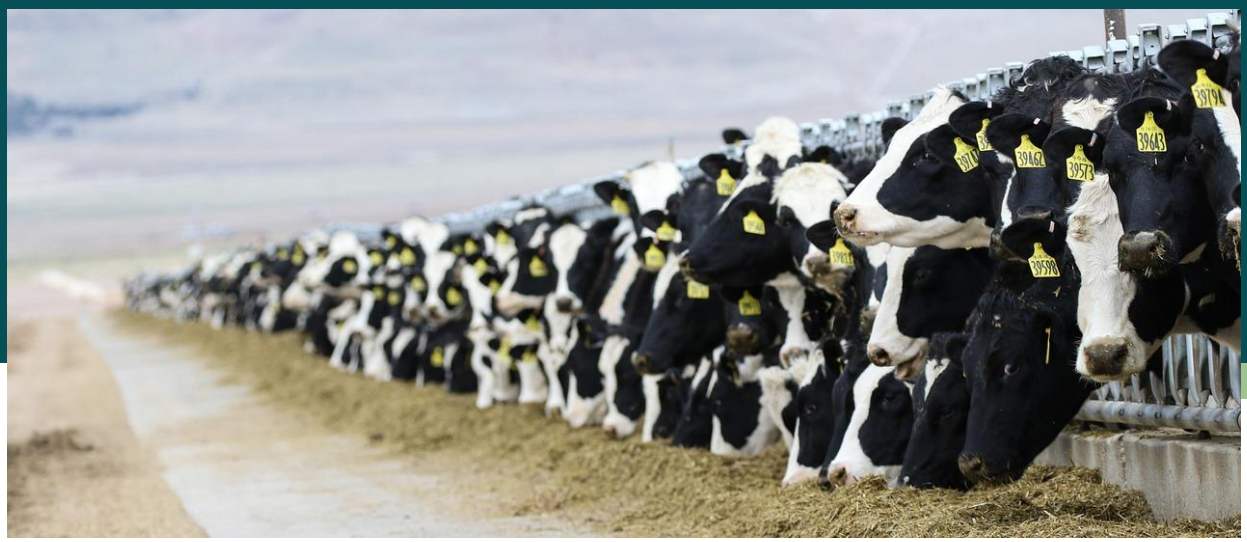
Livestock that are well-cared for are more productive and healthy. Stressed animals may have compromised immune systems, making them more susceptible to disease and require more care, and possibly veterinary intervention. They also tend to have lower reproductive rates, reduced feed efficiency, and slower growth rates.

Understanding livestock behavior and implementing low-stress handling techniques will make you a more effective producer. When you can read livestock body language and respond appropriately to their needs, daily tasks become easier and safer.

Today's consumers are increasingly conscious about how their food is produced and are willing to pay premium prices when producers prioritize animal welfare. Additionally, major retailers and food service companies are establishing animal welfare standards that suppliers must meet to maintain market access.

Farms built on good animal welfare practices tend to be more resilient and sustainable over time. These operations may have lower veterinary costs, reduced mortality rates, and better relationships with neighbors and the community. Producers are also positioned to adapt to changing regulations and consumer demands.





SECTION 1

Behavior and Welfare

Assessing animal welfare and well-being

There are several frameworks that individuals use to assess animal welfare and well-being, and each has their own advantages and disadvantages. Listed below are a few of the frameworks that you can explore to gain a better understanding of how animal welfare and well-being can be assessed. These frameworks are best used as guiding tools to inform decision-making on farms and in livestock care settings.

1. The Five Freedoms and Provisions – John Webster
2. The Five Domains
3. The Welfare Quality Assessment System

Key terms for understanding animal handling

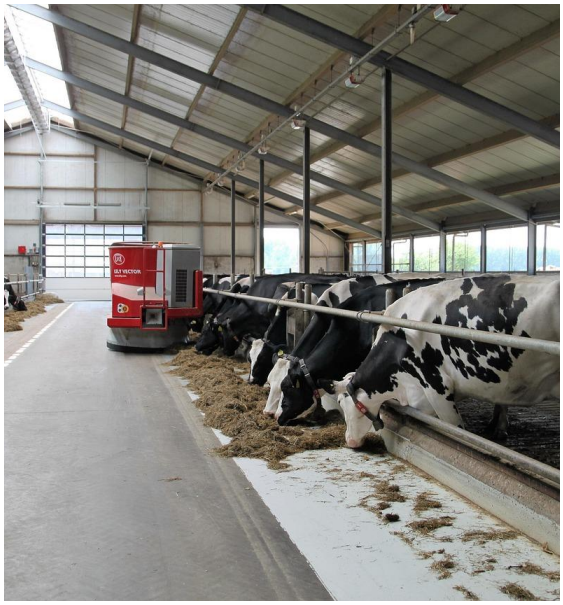
Zone of Awareness: When the animal turns to face a person and acknowledges their presence, but the person is not yet close enough to incite movement.

Flight Zone: The area in which a person enters that causes livestock to move in the desired direction. The size of the flight zone is species-dependent & is influenced by previous experience.

Point of Balance: Usually at the animal's shoulder. When you cross this threshold, you cause the animal to stop or change direction.

Balking: When animals stop abruptly and refuse to move.

Rushing livestock, especially when stressed, will only make livestock movement more difficult. In a high-stress state, animals hide injury/pain and protect themselves by kicking, biting, clawing, etc. When working with a group of livestock, moving in a zig-zag motion behind the group uses a pressure and release method. **This article** goes into depth and provides visual examples of animal handling concepts.



The following figures show a horse and cow's visual range, including their blind spots. They also show an example of flight zone and point of balance. These diagrams aid in teaching these concepts but each animal will have their own level of comfort and should be handled with respect and caution. When working with a group of livestock, the same flight zone and point of balance concepts apply; the flight zone of a herd or flock will depend on the individual animal with the largest flight zone. Using a back and forth zig-zag motion and multiple people may be more effective in working with large groups of livestock.

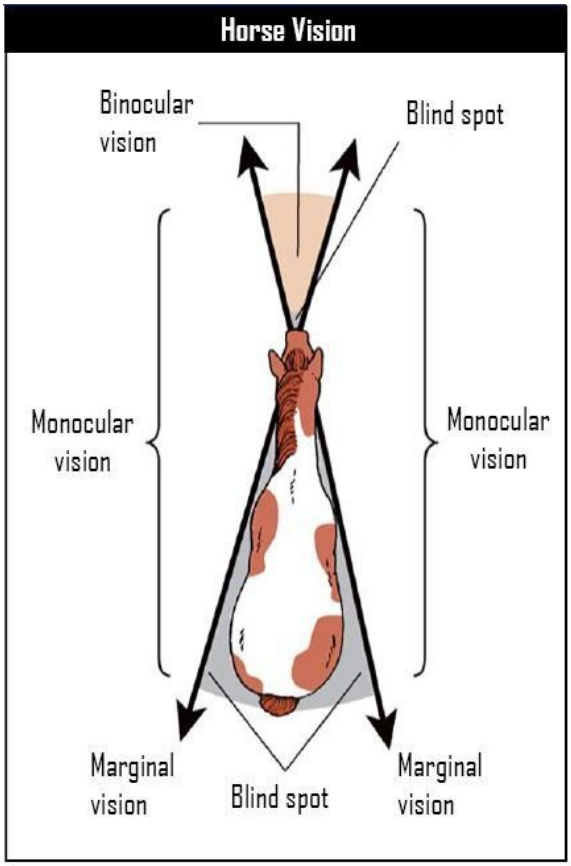


Figure 1 (above). Diagram of vision for horses from Merck Veterinary Manual.

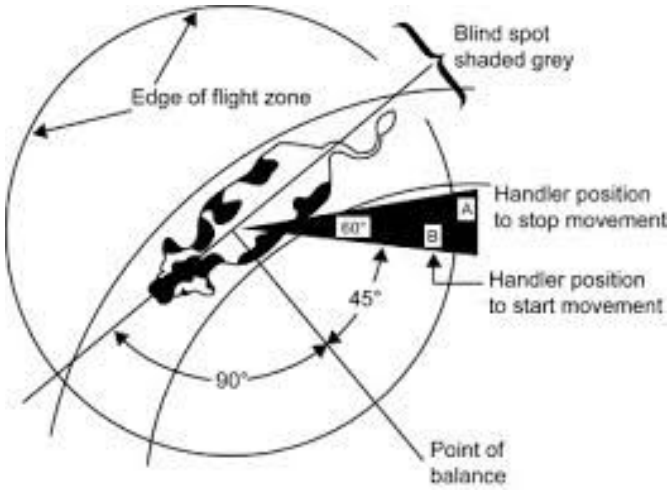


Figure 2 (right). Diagram of flight zone, point of balance, blind spot, and handler position for moving cattle by Dr. Temple Grandin.

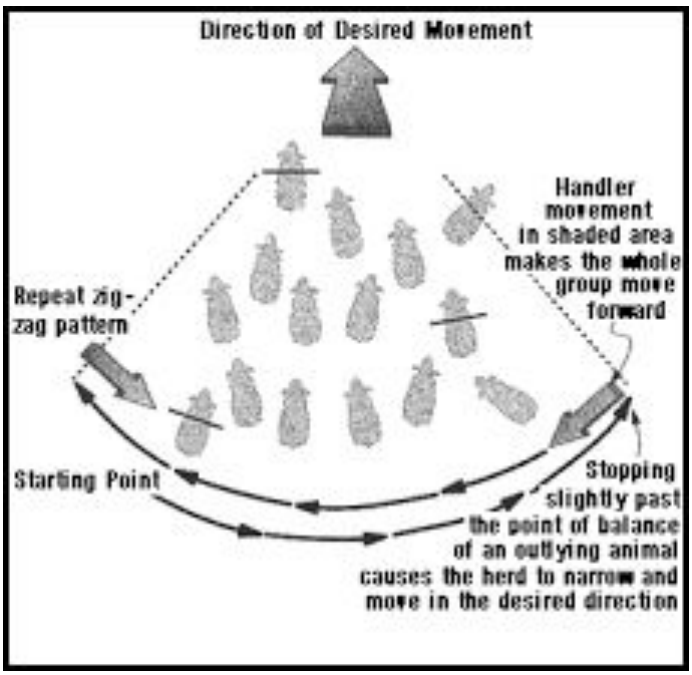


Figure 3 (right). Demonstration of Zig Zag cattle group movement by Dr. Temple Grandin.

Troubleshooting Livestock Movement Issues

What do you do when livestock do not want to move or do not go in the direction you want them to?

- Plan out the route of movement in advance and remove any obstructions or barriers.
- Look for potential injury hazards such as holes, debris, slick spots, narrow areas, or sharp turns.
- Look at the environment and try to see what the animal sees
    - Other people within the flight zone
    - Distracting sounds and sights
    - Objects affecting movement (chains, barriers, broken fences, ropes, etc.)
    - Hard angles – cows like soft turns as their bodies are better suited for that
    - Drastic changes in lighting – bright outside and dark inside or vice versa.
        - Headlights
        - Shadows
        - Moving livestock in complete darkness
    - Glares bouncing off vehicles, equipment, tools, etc.
- A change in flooring will slow down the movement of livestock.
    - When working with livestock, provide non-slip flooring, if possible.
- Allow the leader to investigate an area

Quality Assurance Programs

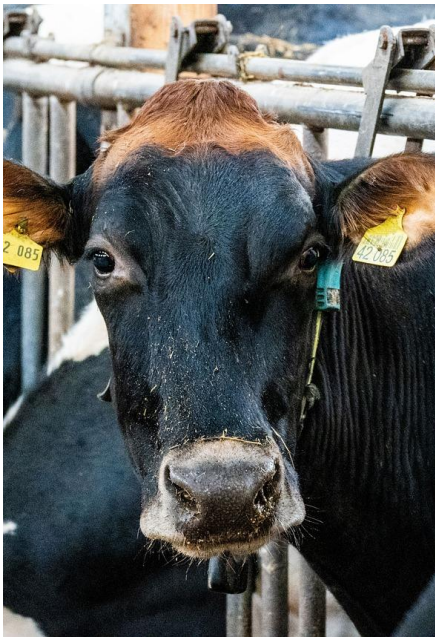
Quality assurance programs provide education on animal care and management standards and may be required for some markets. Animal care standards are reviewed regularly and are based on scientific evidence. Some examples of animal care standards are:

1. **FARM Animal Care Program**
2. **Beef Quality Assurance**
3. **Pork Quality Assurance**
4. **Sheep Quality Assurance**

Low-Stress Handling

Low-stress handling of livestock a skill that is learned through experience and practice. Livestock recognize people and remember those who work calmly. Some initial points to remember when working with livestock are:

- Herd animals will follow one another.
- Livestock want to return to the place they feel safe and are most comfortable.
- Animals speak with their body language – head movement, ears, and posture can indicate the animal's level of stress.
- An isolated animal can be more stressed.
- Livestock are more likely to approach calm people.

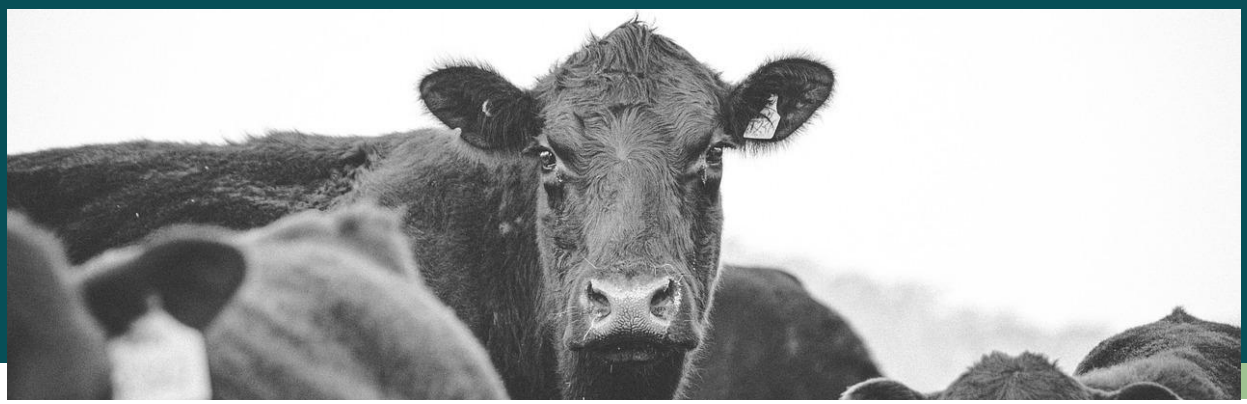


Loading and unloading livestock can cause stress. **This article** covers trailer ramps, chute designs, and some facility designs that can be used to reduce stress.

Low-stress restraint is another component of management. The restraint area may need to be used throughout multiple phases of an animal's lifetime and producers should aim for it to be as positive of an experience as possible.

Process for Getting Started

Expand your knowledge on what low-stress livestock handling techniques. Always focus on remaining calm while handling livestock. If you become overwhelmed when working with livestock, step away, calm yourself, and come back later. Livestock may have environmental preferences; for example, livestock prefer to move to light and open spaces.



BEHAVIOR AND WELFARE

COMMON QUESTIONS

01 How do I move livestock in the direction I want them to go?

Use the animals point of balance and flight zone to get the animals to move in the direction you want them to go. Remember that livestock prefer to move in well lit spaces with no sharp corners, minimal obstructions, and minimal flooring changes.

02 Why are my animals afraid to go into the chute or barn?

Animals prefer to move into light, open areas. Consider adding a bright light to the area in which you are trying to move them.

03 How do I stop my livestock from jumping and falling out of the trailer when I unload them?

Always allow animals to load and unload in their own time. Make sure that the flooring provides adequate traction, add light and additional gating if necessary.

04 Why should I care about animal welfare?

The well-being and welfare of livestock is directly related to the livestock production, health, and presentation of natural behaviors.

05 Can I keep only one animal?

Most livestock are herding animals and prefer others of their own species as company.

Necessary resources and Partners – Please see Livestock Resources and Partners Appendix at the end of this chapter.

LIVESTOCK

Feed Handling and Storage



AUTHORS & INSTITUTIONS

Michael Metzger, Small Ruminant Educator, Michigan State University Extension

Katie Ockert, Community, Food, and Environment Educator, MSU Extension

Casey Zangaro, Swine Educator, MSU Extension

SECTIONS

Section 1: Livestock Feed Handling and Storage

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Proper nutrition is important when raising any species of livestock. There are a number of considerations to make regarding feed including proper feed product selection, storage to maintain nutritional value, and overall feed costs. All of these factors impact animal health, growth, reproduction, and overall productivity.

Whether you are producing eggs,milk, meat, or fiber, proper nutrition is necessary for the animal's well-being. A balanced diet that provides the necessary nutrients like protein, vitamins, minerals, energy, and water is important to help the animals maintain their health and optimize feed efficiency. Feed costs will be one of the highest costs to the producer.

How To Get Started

Producers should research what type of digestive system the species has (ruminant/monogastric/hind gut fermentors), the nutritional requirements for the species, the life stage, and production type of the animal they are raising. Understanding basic nutrition is essential–what is the purpose of protein, carbohydrates, fiber, fats, vitamins, and minerals that are in animal feed. Additionally, being aware of any specie specific feed ingredient toxicities and poisonous plants is important.



SECTION 1

Feed Handling and Storage

Primary Considerations

Regulations and Animal Safety

Not all feeds are created equal; feed formulation, quality, and price may differ between within the same species. It is important to follow the feed label directions when feeding livestock. This is especially important when using medicated feeds. All medicated feeds will state “MEDICATED” on the feed tag. For example,feeds that contain certain medications that are used for ruminants may be deadly if fed to swine or horses. Also, sheep are sensitive to copper and should not be given feeds or mineral mixes that are formulated for other livestock especially those formulated for poultry and swine as these are often very high in copper.

Feed Handling and Storage

It is important to store feed properly to prevent spoilage and keep your animals healthy. Most feeds are stored dry; feeds should be kept dry to prevent mold and spoilage as these can be detrimental to both feed quality and animal health.

Store feed in a dry, covered area and up off the ground — Keep feed away from moisture and direct sunlight as both can potentially affect the quality of the feeds. Feed (including hay) can draw moisture from the ground, including concrete, and should be stored inside on pallets or shelves.

Pests, such as mice, rats, raccoons, or other wildlife can contaminate feed. Storing feed in areas where potential contamination cannot occur is important. Open feed should be stored in sealable containers to limit pest access.

Label feed storage containers — Labeling storage containers is especially important if the feed is removed from the original labeled bag and you have different species and/or ages of livestock.

Keep feed fresh —Some minerals tend to lose their potency after a certain amount of time.

Clean up spilled feed immediately —Spilled feeds can attract rodents and other pests that can cause diseases in livestock.

Consider storage times —The storage time of feed depends on many things including the type of feed, how it was harvested and handled, and other factors. For example, after forages are harvested the vitamins degrade rapidly and animals that are fed dry hay should have vitamins added to the mineral mix.



Pasture grazing – Animals can be grazed on pasture to meet their nutrient requirements. Not all pastures will meet the requirements of all animals; especially those that are growing or lactating. Producers should become familiar with body condition scoring (BCS) to make sure that animals maintain adequate body condition while on pasture. The quality of the feed in the pasture will depend on what plant species are in the pasture as well as their stage of maturity.

Quality can also be influenced by soil type, fertility, and the amount of moisture it receives. Animals may need supplementation if the pasture does not meet their nutrition needs.

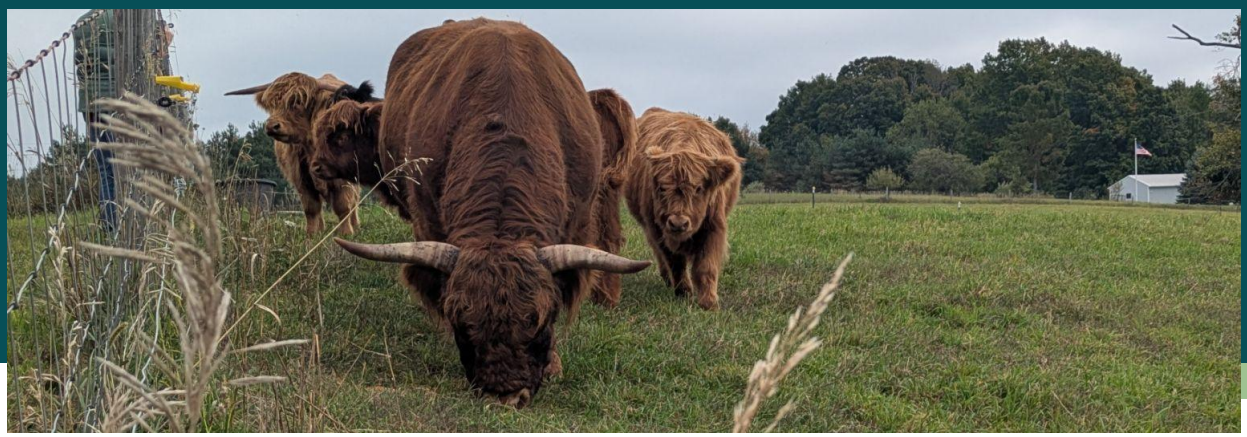
Water –Supplying fresh, clean water is essential for all species. Water tanks or troughs should be kept clean and should be available at all times, and located within acceptable walking distance for the species.

Process for Getting Started

Research the requirements of the species that you are raising. Evaluate the available feed sources in your area. Are there complete feeds available, or will you need to work with a local mill to mix grain? Supplementation of vitamins and minerals may need to be provided, such as loose minerals, to meet the nutritional requirements of your livestock. These supplements will have an ingredient tag with them to inform you of what nutrients are provided.



Dietary supplements may assist in preventing metabolic deficiencies, but must be managed to avoid causing toxicities. Additionally, if you have ruminants (cattle, sheep, and goats), you will need to provide forages, such as hay. The type of forage is species dependent, such as long-stem for cattle, sheep and goats, or alfalfa pellets/cubes for horses. Hay and pasture can be tested to provide a nutrient breakdown to aid you in best selecting the quality and forage mix that suits your needs.



FEED HANDLING AND STORAGE

COMMON QUESTIONS

01 How many animals can I graze per acre?

The number of animals that can be grazed on an acre of pasture will depend on many factors and can vary from year to year. Forage species, soil type, soil fertility, the amount of moisture available, and the time of year influence the number of animals that can be grazed per acre of pasture. This number will also be influenced by the type of grazing you are doing. If a pasture is continuously grazed it will support fewer livestock than if it is rotationally grazed. Rotational grazing allows livestock to be rotated between multiple pastures and allowed to graze for a period of time before being moved to another area to graze allowing at least 3 weeks for the first area to recover.

02 Can grazing animals meet their nutritional needs?

A good pasture can meet the nutritional needs of many species of livestock. Lactating livestock may require added energy in addition to the pasture. Body Condition Scores (BCS) should be monitored to make sure animals nutritional needs are being met. See resource section for species specific BSC scoring.

03 What is better to feed, a commercially available feed that can be purchased at a farm store or one that is mixed at a feed mill?

Both types of feeds can be used. If you are only feeding a few animals it may be more convenient to just purchase a bag of feed as needed from the farm store as a minimum batch size from the mill may not be as fresh as it should be by the time you get to the end of the batch.

04 Should I feed table scraps to my livestock?

Typically, human food scraps should only be used as treats in small amounts to not upset the digestive systems of the livestock. Diet changes can cause digestive upset if large amounts are given too rapidly.

05 What besides grain should I feed my animals?

Fiber is a very important part of the diet of ruminants. This can be given to them in the form of pasture or hay. Alfalfa pellets do not typically meet the long stem forage requirement of ruminants. All classes of livestock should also be given the appropriate vitamins and minerals that they require. Clean water should be accessible at all times.

Necessary resources and Partners – Please see Livestock Resources and Partners Appendix at the end of this chapter.

LIVESTOCK

General Housing



AUTHORS & INSTITUTIONS

Michael Metzger, Small Ruminant Educator, Michigan State University Extension

Katie Ockert, Community, Food, and Environment Educator, MSU Extension

Casey Zangaro, Swine Educator, MSU Extension

SECTIONS

Section 1: Housing Requirements

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Having the right housing and facilities is a basic part of good livestock management. Appropriate housing helps to keep animals healthy, comfortable, and performing well. Each species has different housing needs. Housing should be designed with species needs in mind.

For example, dairy cows benefit from free-stall barns with proper ventilation for comfort and cleanliness. In contrast, beef cattle are often kept in open or semi-open sheds with designated pens. Pigs may be housed in indoor systems with slatted floors to aid waste management or raised on pasture systems emphasizing natural behaviors. Similarly, sheep and goats thrive in sheds with good airflow and lots or pastures with ample room to move. Poultry generally requires controlled environments such as coops or aviaries to maintain optimal temperature and light conditions. A thoughtful start in choosing the right type of housing sets the stage for efficient, humane, and sustainable livestock management.

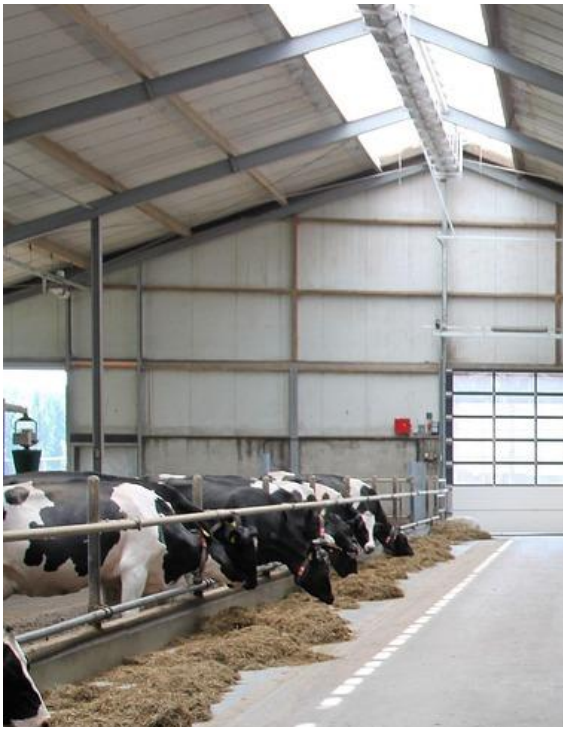
How To Get Started

Before building or changing existing livestock housing, make sure you have a solid plan and understand the needs of your chosen species. This will save you time and resources as you progress in your livestock journey. The housing system should match farm size, labor capacity, and long-term goals. Here are some items to consider:

- Animals need access to fresh food, clean water, and good air flow. There are many methods that can be used in animal housing systems, ranging from automated to manual, such as feeders and waterers.
- Ventilation is essential; it keeps air moving throughout the structure and helps prevent health issues. Waste management should also be a consideration. Manure pits or compost setups can help keep the housing area clean and reduce odors and harmful gases.
- Bedding and flooring choices are also important. Bedding can help regulate temperature, enhance animal comfort, absorb moisture, and reduce odors. Bedding materials such as straw or sawdust absorb waste and keep animals comfortable, while concrete floors or rubber mats make daily cleaning easier. Producers must choose the appropriate bedding and flooring materials based upon the species and facility type.



- Disease control should also be considered. Implementing biosecurity practices such as a place to disinfect boots and tools, and limiting visitors in your facility may help reduce risk of disease transmission.
- Animal handling devices such as using sturdy gates, chutes, or headlocks are also important. Strategically placing these items throughout your facility can increase efficiency and improve animal wellbeing in regards to handling and movement.



- Adequate lighting is an often overlooked but important design component for facilities. Lighting is not only important for visibility, but also helps animals maintain their circadian rhythm and can be used as a breeding management tool. Placing lighting in corners and alleyways as well as main isles will increase visibility for producers and animals throughout the facility.



SECTION 1

Housing Requirements

Providing adequate space is essential for animal health, growth, and production. Each species will have different space requirements depending on life or production stage. The following table can be used as a guide for providing the appropriate minimum space.



General Space Requirements per Species

Species	Indoor Space per Animal	Notes
Dairy Cows	100–140 sq ft	For comfort and feeding, greater sq ft is needed for late gestation and recovering cows.
Dairy Calves	Young calves - 35 sq ft 650 lbs - 40 sq ft 850 lbs - 50 sq ft 1100 lbs - 60 sq ft	Based on age and size of animal for a bedded pack resting space only, feed area not included (Source: DCHA).
Beef Cattle	25–50 sq ft (feedlots)	More space for pasture
Pigs	8–12 sq ft	Based on age/weight
Sheep/Goats	12–16 sq ft	More in pasture systems
Poultry (standard sized birds)	2-3 sq ft coop space per bird; 10 sq ft outdoor run space per bird	Provide 8-12 inches of roosting space per bird Provide one nesting box for every four hens

Process for Getting Started

Understanding housing requirements is an essential first step. Each species has specific needs regarding space, shelter, ventilation, and protection from weather, and predators. Producers should start by deciding which species they want to raise, then learn about the basic housing needs for those animals. Good housing should keep animals comfortable and healthy, allow for easy feeding and cleaning, and comply with local rules and regulations. Starting with a simple setup that meets the animals' basic needs and allows for future growth is a smart approach.



GENERAL HOUSING

COMMON QUESTIONS

01 Is indoor or outdoor housing better?

There is no one-size-fits-all answer; it depends on the livestock you're raising, the local climate, and your overall goals. Indoor housing gives you more control over temperature, ventilation, and cleanliness, which can be a significant advantage in extreme weather or for animals that are more sensitive to environmental changes.

Keeping animals outdoors or on pasture typically costs less for set up and maintain. By using recommended space requirements and stocking densities, pasture systems can provide animals with space to move around and exhibit natural behaviors. A potential challenge to pasture systems is that they require more land and can be more challenging to keep animals safe from adverse weather conditions and predators.

Many producers use a mix of both systems; maintaining animals indoors during bad weather or for specific stages of production and letting them out on pasture when conditions are right.

02 What is the role of bedding and flooring in livestock housing?



Bedding plays a significant role in keeping animals healthy and comfortable. Good bedding, like straw, wood shavings, sand, or sawdust, helps absorb moisture, provides insulation, and gives animals a dry, clean place to rest. This is especially important in colder climates, during specific production times, or when animals are housed indoors for long periods of time.

Flooring such as concrete or dirt are options. Concrete is preferred because it is durable and easy to clean, but it can be hard on animals' legs if there's not enough bedding available. Rubber mats or slatted floors can provide better footing and reduce the risk of injuries, especially in high-traffic areas such as milking parlors or feeding stations.

Bedding and flooring choices should match the waste management system. Various waste management strategies such as composting or using a liquid manure system will determine the type of bedding materials that can be used.

03 Do I need to provide shade to my animals on the pasture?

Although Michigan does not have laws requiring livestock to have shelter while on pasture, it is suggested that animals have access to shade, wind breaks, or indoor environments during hazardous weather conditions, such as extreme heat, heavy rain, and snowfall. The absence of shade can lead to serious health issues or death for any species. Extreme temperature events (heat and cold) can cause decreased feed intake, poor weight gain, lower milk or egg production, and reduced fertility.

04 How far should animals have to walk to access water?

Livestock should always have easy access to clean, fresh water and, ideally, should not have to walk long distances to reach it. For optimal health and performance, water should be located within 300–500 feet for cattle, 200–300 feet for pigs, and no more than 600 feet for sheep and goats. Poultry need waterers placed just a few feet away, as they won't travel far to drink. When animals cannot easily access water, they will consume less, which can lead to dehydration, heat stress, and reduced productivity. Placing water sources strategically in pastures or near shade helps encourage regular drinking and supports animal well-being. In rotational grazing systems, consider moving water with the animals to maintain consistent access to water.

05 Do spacing requirements change during different stages of growth or production?

Spacing requirements change throughout various stages of growth and production for all livestock species. Animals need more space as they grow, and their space needs also shift depending on whether they are breeding, gestating, parturition, nursing, or finishing. Having the correct amount of space is vital for supporting animal health, reducing stress, and promoting natural behaviors.

Young animals require smaller areas early in life. Still, their need for space increases significantly as they grow. Breeding animals often need additional room to reduce aggression, allow for safe movement, and support natural mating behavior. Lactating animals need more space to lie down comfortably, care for their young, and access feed and water without competition. Finishing animals raised for meat also benefits from more space to improve feed efficiency and reduce injuries from crowding. It is essential to understand each species' production cycle and adjust the living space accordingly.

Animals that are overcrowded at any stage can lead to poor growth, increased disease risk, stress, and aggressive behavior. This is a critical aspect of responsible management, necessary for maintaining animal welfare and productivity.

Necessary resources and Partners – Please see Livestock Resources and Partners Appendix at the end of this chapter.

LIVESTOCK

Health Management and Disease Prevention



AUTHORS & INSTITUTIONS

Michael Metzger, Small Ruminant Educator, Michigan State University Extension

Katie Ockert, Community, Food, and Environment Educator, MSU Extension

Casey Zangaro, Swine Educator, MSU Extension

SECTIONS

Section 1: Health Management and Disease Prevention

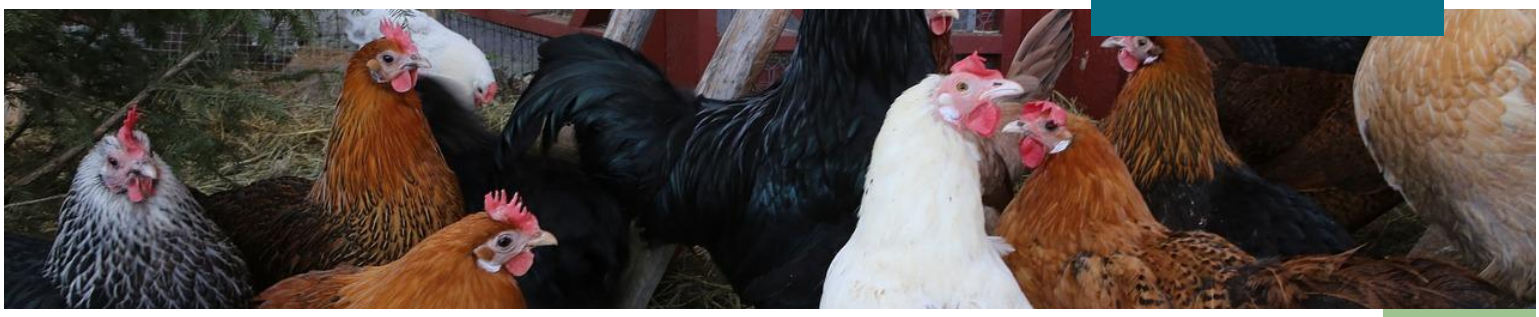
Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Farmers can manage risk by employing strategies that optimize animal health and protect them from disease outbreaks. Developing a comprehensive health program will help minimize expenses and increase productivity. This section will discuss several considerations when developing a herd health management plan.

How To Get Started

Comprehensive health management plans include determining vaccination programs, parasite management plans, on farm biosecurity practices, humane euthanasia considerations, zoonotic disease prevention, and consideration for various regulations. Each of these items will contribute to the overall health and safety of animals.



SECTION 1

Health Management & Disease Prevention

Providing adequate space is essential for animal health, growth, and production. Each species will have different space requirements depending on life or production stage. The following table can be used as a guide for providing the appropriate minimum space.



Primary Considerations

Vaccination Program

Vaccines are an essential part of a good health management plan. The American Veterinary Medical Association (AVMA) advocates for safe, effective, and scientifically based vaccines for animals and considers vaccines part of the animal's health history. Individual species require different vaccines, and with your veterinarian, you can utilize a medically based approach to vaccination based on the preventative health needs of your herd or flock.

Parasite Management Plan

Parasites can affect all animal species, both internally and externally. Infestations can impact the overall health and performance of animals and increase the risk of disease and mortality. Utilizing proper management and treatment options together is the most effective way to minimize parasite risk. Environmental management strategies minimize animal exposure to parasites in conjunction with anthelmintic (medications used to destroy parasites) treatments.

Management Strategies

- Utilizing rotational grazing
- Grazing younger animals before older ones
- Allowing pastures to rest
- Avoid overcrowding animals
- Stocking animals at appropriate densities
- Culling animals that are genetically predisposed to parasite susceptibility

Treatment Options

- Breaking the lifecycle and avoiding reinfestation
- Anthelmintic administration should be based on the targeted parasite load, parasite susceptibility to treatment, and the potential impact that removing or decreasing the parasite load will have on the animal and the environment
- Conducting a fecal egg count with your veterinarian to evaluate the parasite load prior to treatment

Biosecurity

Biosecurity is the implementation of management practices used to reduce the risk of disease transmission on your farm and to other farms. Some basic practices that all livestock owners should implement are:

- Washing hands before and after handling animals
- Having dedicated footwear that are only worn while caring for and working with animals on your farm
- Wearing clean clothing that has not been exposed to animals on other premises or places where other animal owners may gather (i.e., farm supply store, feed mill, etc.)
- Identifying and isolating sick or new animals
- Caring for sick or new animals after caring for healthy animals in your main herd or flock

- Using separate tools and equipment such as feeders, buckets, and water tanks for isolated animals and not sharing those items with healthy animals
- Cleaning and disinfecting equipment and tools (water tanks, buckets, brushes, chutes, sorting boards, sorting sticks, etc.) regularly
- Regularly cleaning and disinfecting animal housing areas
- Properly storing feed to avoid cross-contamination
- Employing practices to control rodents and other wildlife
- Isolate animals that have traveled off the farm for any reason (exhibition, veterinary visits, ect.)

Euthanasia

Euthanasia is a humane death that occurs without pain or distress. Even with the best efforts, at times, euthanasia may need to be considered. Producers must consider animal welfare, economics, and public health when making decisions regarding an ill, injured, or disadvantaged animal. The veterinarian you have a Veterinary Client Patient Relationship (VCPR) with can assist in making the appropriate decision. Four categories may be considered when deciding how to proceed with a sick, injured, or disadvantaged animal:

- **Treatment**—if appropriate medical treatment is available, it may be a viable option
- **Slaughter**—It may be a viable option if the animal is suitable for transport and human consumption
- **Sell**—This option may be available for an injured or disadvantaged animal that still has the capacity to perform in a different production environment
- **Destruction**—Humane euthanasia and an approved method of carcass disposal may be the best option for various animal welfare, economic, or public health reasons

Zoonotic Disease

Zoonotic diseases are infections that can spread between people and animals. Viruses, bacteria, parasites, and fungi can cause infections. Diseases can range from mild to severe; severe diseases may result in death in both animals and humans. Some examples of zoonotic diseases are (Note: this is not a comprehensive list of zoonotic diseases):

Virus	Bacteria	Parasites	Fungi
Highly Pathogenic Avian Influenza	Brucellosis	Cryptosporidiosis	Ringworm (*Trichophyton verrucosum, Trichophyton mentagrophytes)*
Swine Influenza	Tuberculosis	Giardiasis	Swine Influenza
	Salmonella		
	Campylobacter		
	E. Coli		
	Q Fever		

Good biosecurity practices both on and off the farm are important to reduce the risk of zoonotic disease transmission.

Regulations

The Michigan Department of Agriculture and Rural Development (MDARD) regulates agriculture in the state. Animal owners should be aware of and consider various regulations as they acquire, sell, and transport livestock.

- **Animal ID & Movement regulations**
  Regulations for transporting animals vary by species. If animals are imported from another state, a Certificate of Veterinary Inspection must be issued before they are transported into or out of the state. There may also be other regulations for displaying or exhibiting animals.Certain species must have official animal identification. Owners must establish a premises identification number (PIN) to obtain official identification. Visit the MDARD website to determine what identification is required for your species. To register your premises or to request your existing PIN, call MDARD's Atlanta Field Office at 888-565-8626.
- **Bodies of Dead Animals Act (BODA)**
  There are guidelines for adequately disposing of dead animals to protect human, animal, and environmental health. The BODA information applies to animals that are not intended for human food.
- **Generally Accepted Agricultural Management Practices (GAAMPs)**
  GAAMPs are guidelines for farm management that help promote a positive image of Michigan agriculture. Farms that follow GAAMPs are afforded a certain level of protection if a nuisance complaint is filed against them.

Process for Getting Started

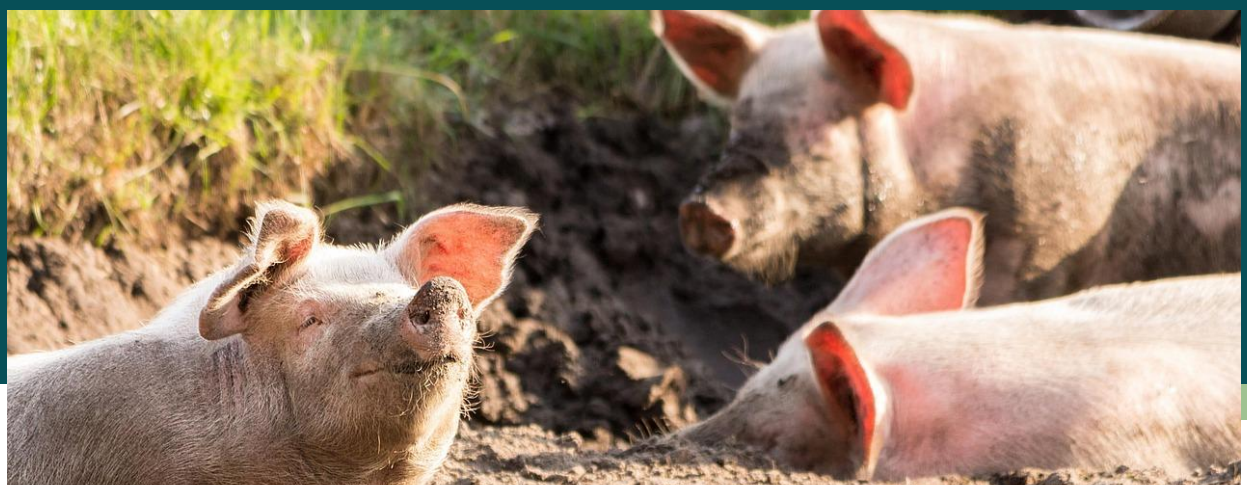


Developing a relationship with a veterinarian is integral to veterinary oversight of animal health and proper drug usage in livestock operations. Establishing a VCPR is the basis for a working relationship between animal owners and veterinarians. The agreement means that the veterinarian has assumed the responsibility of having you as a client, knows your livestock and on-farm management practices, and provides care and treatment for your animals. According to the AVMA, a VCPR exists when the following requirements are met:

- The veterinarian has assumed responsibility for making clinical judgments regarding the patient's health, and the client has agreed to follow the veterinarian's instructions.
- The veterinarian has sufficient knowledge of the patient to initiate at least a general or preliminary diagnosis of the patient's medical condition and care. This means that the veterinarian is personally acquainted with the patient's keeping and care by virtue of a timely examination of the patient or medically appropriate and timely visits by the veterinarian to the operation where the patient is managed.
- The veterinarian is readily available for follow-up evaluation or has arranged for veterinary emergency coverage and continuing care and treatment.
- The veterinarian provides oversight of treatment, compliance, and outcome.
- Patient records are maintained.

The veterinarian can help you create a vaccination schedule and parasite management program, identify biosecurity practices, communicate state and federal regulations and assist in any treatments that may be required.

To learn more about VCPRs, visit **https://www.avma.org/resources-tools/pet-owners/petcare/veterinarian-client-patient-relationship-vcpr.**



HEALTH MANAGEMENT & DISEASE PREVENTION

COMMON QUESTIONS

01 Do I have to vaccinate my animals?

Each species has a recommended vaccination schedule. Michigan State University Extension encourages all producers to work with their veterinarian to determine what vaccination programs are appropriate for their operation.

02 Where can I source vaccination and anti-parasitic products?

Many vaccinations and anti-parasitic products can be purchased from your veterinarian, through an online animal health company, or at local farm stores. All products should be properly labeled and stored in order to maintain effectiveness. If using a product for an animal or use not listed on the label, you must consult with your veterinarian before use.

03 How strict does my biosecurity have to be?

Producers should always follow good management practices. Each farm will have its own risks that must be assessed to determine how strict the biosecurity practices should be. For example, if you are planning on having customers and vendors, such as feed deliveries, coming on to your farm regularly, it is important to enhance your biosecurity measures.

04 How do I choose a veterinarian to establish a VCPR with?

Choosing a veterinarian is like choosing a doctor; you must feel comfortable with them and develop a relationship with them. Building trust is essential. Learning about the veterinarians in your area and getting recommendations from other producers can help you select a veterinarian to work with.

05 How do I learn about state and federal regulations?

To learn about state and federal regulations, visit either the Michigan Department of Agriculture and Rural Development or United States Department of Agriculture websites.

Necessary resources and Partners – Please see Livestock Resources and Partners Appendix at the end of this chapter.

LIVESTOCK

Manure and Mortality



AUTHORS & INSTITUTIONS

Sarah Zeiler, Environmental Management Educator, Michigan State University Extension

SECTIONS

Section 1: Environmental Risks

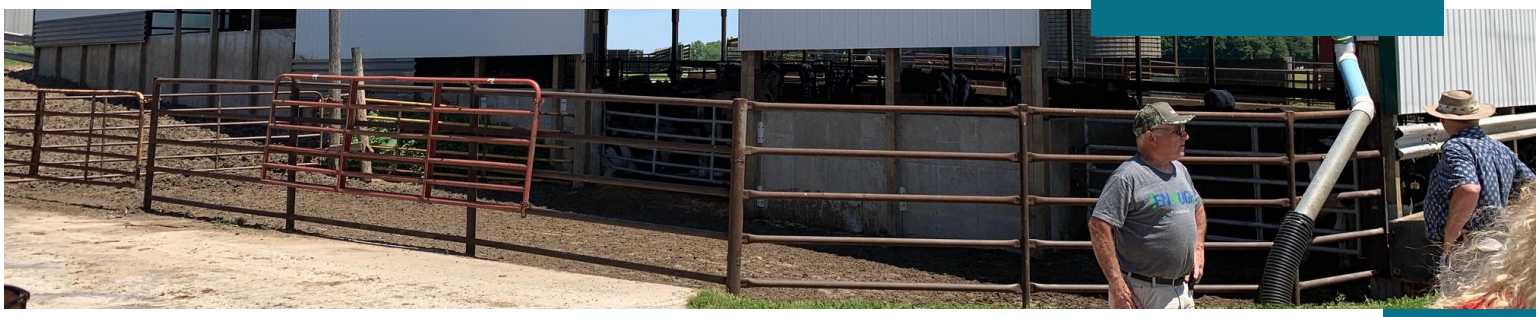
Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Caring for livestock brings with it a unique set of challenges and responsibilities. When managing livestock you must consider not only the welfare of the animal and production efficiencies but also the environmental impacts of the operation. This awareness can reduce environmental risk and financial liability and in some cases allow for participation in programs that can pay the operation for good stewardship.





How To Get Started



Developing a manure management plan may seem like a daunting task or something done by large farms, but the components of a plan can be applied to all types of farming operations. A common misconception is that manure management must be an all-or-nothing approach.

This is not necessarily true as many plans are developed and implemented using an integrated approach. Many small farms can benefit by looking at the components of a manure management systems plan, evaluating what is feasible for your farm, and understanding what options may be available. It also enables you to develop a sustainable plan for the future by reducing environmental risk and streamlining fertilizer costs.

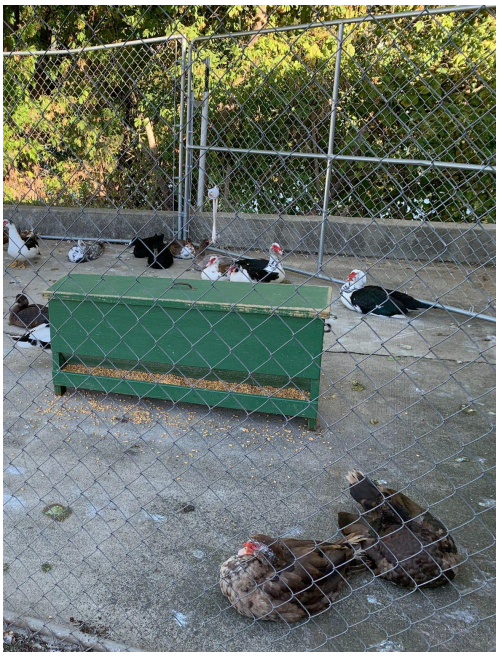


First, think about what encompasses your farm.

Describe your farm: Identify the goals, future growth objectives, current resources, and number of animals that currently reside on your farm.

Map land base resources: Identify the number of acres you own or lease and the number of these acres usable for specifically managing and caring for your animal(s). Acres to exclude from this calculation would be any area where manure should not be spread or where it is not feasible, such as wetlands, wooded areas, buildings, riding arenas and other areas.

By doing this initial exercise, you will get an informed perspective as a starting point.



Next, you will need to calculate the volume of manure produced by all your animals.

You can find assistance with this calculation in the **Small Farm Manure Management Planning factsheet**. Having an accurate idea of how much manure you are dealing with on a monthly basis will be extremely helpful in the planning process as well as in helping you understand if your land-based resources are adequate.

Manure collection is the next piece of information you will need.

Manure collects in barns, pastures, dry lots and other places. These places lead to collection at different intervals. Your animals may be housed at another facility for part of the year, like show horses or only be raised on the farm for part of the year, like broiler chickens. When you know the daily amount and the number of days, you can calculate the amount of manure that is being produced on the farm.

With this information, you can decide on the size and type of manure storage facility you need or alternative manure treatments, like composting. Composting can also be useful in dealing with inevitable animal mortalities.

Manure, once collected and stored, must be disposed of in a responsible way.

Making a plan to do this and carrying it out is the final step of manure management. What land base and equipment you have available to you is a big part of deciding how and when to do this. Considering the weather and your neighbors should also be a part of your decision-making.



SECTION 1

Environmental Risks

Primary Considerations

- Water quality
- Soil health
- Animal welfare
- Neighbor relations

Process for Getting Started

- Calculate the amount of manure created
- Build an appropriate storage or compost facility
- Make a plan for an environmentally responsible application
- Carry out your plan

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



MANURE AND MORTALITY

COMMON QUESTIONS

01 How do I test manure?

Book values of manure are just averages and don't consider factors such as varying storage and application losses, temperature, diet or other factors. The first step to figuring the value of your manure is to take a representative sample and send it in for analysis. **Several certified laboratories** are available, with a typical cost of around $32 per sample for a basic analysis. It is important to use proper collection techniques when the sample is collected. The lab you select will have sampling instructions on its website.

02 How do I compost manure?

Composting is the managed biological decomposition process that converts organic matter into stable, humus-like material. Microorganisms, including bacteria and fungi, break down organic components of manure and bedding into smaller particles. The resulting compost is a dark, earthy-smelling product like potting soil. Four key factors will determine the success of your composting efforts: Carbon to nitrogen ratio, moisture content, temperature range, and aeration.

03 How can I start a livestock farm?

While my answer can't encompass everything you will need to know you should be aware of the ***Right to Farm (RTF)*** and ***Generally Accepted Agricultural Management Practices (GAAMPs)***. Following these laws and rules will dictate whether you have an affirmative defense in case people complain about your operation. I suggest you go through the siting process through the Michigan Department of Agriculture to establish this defense.

04 How do I keep my neighbors from complaining?

Some neighbors are going to complain no matter what you do, but that shouldn't stop you from being a good neighbor to them. Two things that help the most are keeping your farmstead clean; people tend to smell with their eyes first. If they see a messy farm they will assume that the offending odor or fly problem is your fault. There are opportune times to spread manure that will lessen the unpleasant odors.

- A good time to spread manure is in the morning. As the day goes on, warm air rises and carries odors up and away from the ground. Spreading in the morning once everyone has left for work can help with neighbor relations.
- A breezy, cooler day disperses odors, unlike warm, humid days. Incorporate manure within 48 hours (unless applied to alfalfa).
- Avoid spreading when the wind is blowing in the direction of residential areas and on weekends or holidays due to the increased potential for people to be home or having larger gatherings.
- Notify your neighbors that you plan to spread. Studies have shown that neighbors who knew a producer tended to notice less odor when spreading manure.

05 Can I get help paying for any of this?

Yes, you can receive assistance to start making your farm business more sustainable. Contacting the partner agencies listed below is the first step. These agencies will help you develop a conservation management plan that can mitigate any resource concerns on the farm. They will also guide you to funding opportunities for costshare, grants, and loans.



RESOURCES & PARTNERS

Necessary Resources

Manure Management

- https://www.canr.msu.edu/resources/small-farm-manure-management-planning

Manure Testing

- https://www.canr.msu.edu/news/manure-analysis-provides-accurate-account-of-plant-available-nutrients

Composting

- https://www.canr.msu.edu/resources/composting_on_michigan_farms
- https://www.canr.msu.edu/resources/carcass_composting_a_guide_to_mortality_management_on_michigan_cattle_farms

Right to Farm

- https://www.michigan.gov/mdard/environment/rtf

Financial Assistance

- https://www.michaelfields.org/grants-advising-resources
- https://www.nrcs.usda.gov/

Partners

- **Michigan Department of Agriculture**
  https://www.michigan.gov/mdard/environment/rtf
- **Natural Resource Conservation Service**
  https://www.nrcs.usda.gov/
- **Farm Service Agency**
  https://www.fsa.usda.gov/
- **Conservation Districts**
  https://www.macd.org/
- **U.S. Fish and Wildlife Service**
  https://www.fws.gov/
- **Pheasants Forever**
  https://www.pheasantsforever.org/
- **Michael Fields Agricultural Institute**
  https://www.michaelfields.org/grants-advising-resources

LIVESTOCK

Procuring Animals



AUTHORS & INSTITUTIONS

Michael Metzger, Small Ruminant Educator, Michigan State University Extension

Katie Ockert, Community, Food, and Environment Educator, MSU Extension

Casey Zangaro, Swine Educator, MSU Extension

SECTIONS

Section 1: Where to Go to Purchase Livestock

Section 2: How to Purchase Livestock

Section 3: Pre-purchase Considerations

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Whether it is your first livestock purchase or you have become a regular at the sale barn, it is wise to know what you are looking for when purchasing livestock. Having a plan for procuring animals that promotes your goals and protects your farm's biosecurity has compounding effects on your entire farm. Using available tools such as health checks, pedigree/genetic data, and production data, producers can set themselves up for success.



How To Get Started

Once you have decided on a species to raise and/or breed, producers can narrow down their production goals to help them decide when and where to purchase stock. Understanding how livestock sales occur–i.e. single producer sales, consignment sales, private sales, etc– will help producers to source livestock from across the United States and Canada. Livestock sales will vary by species and production type, for example if purchasing bred beef cows, they are typically sold in the fall months.



SECTION 1

Where to Go to Purchase Livestock



Livestock can be purchased through different avenues, and each option will have its own advantages and disadvantages. Remember that all newly purchased animals should be isolated from animals already on the farm to protect from potentially spreading diseases (please reference the Health Management and Disease Prevention section for more information).

Before purchasing livestock, research the current market value of animals to give you an idea of how much to budget for potential purchases. If purchasing breeding stock animals, keep in mind that these will be the foundation of your breeding program.

Sale Barn

Sale barns are a standard route for producers to sell cull animals, market-ready animals, and some young stock. Some sale barns host breed stock sales for a variety of species. Animals at sale barns are sold “as is” “where is” and producers may be provided with little or no background information about animals available for purchase. Sale barns sell animals from many production sites at the same time; this can lead to biosecurity concerns due to potential comingling of animals from different herds/flocks.

Auction – In-Person or Online

Auctions provide an opportunity to view a set of livestock that are currently available for sale. Auctions could be sole producer sales or sales that make animals from various farms available to the public. Auctions can be held live at a specific location, date, and time or online for a set duration of time. All auctions will vary in the information that is available on livestock beforehand or during the auction. Be aware that you may need to pay a bidder fee or auction fees and arrange for transportation for any livestock that are purchased.

Direct Sale

Producers can buy animals directly from another producer. Local associations, such as a cattlemen’s association or breed association, may provide a list of potential sellers. Be cautious of on-line sales for livestock and always visit the farm, or have a trusted individual visit for you, and inspect the animal and the producer's management practices.



SECTION 2

How to Purchase Livestock

There are many ways to purchase animals. It can be done solely by the producer or through a livestock buyer's agent.

Hired Livestock Buyer

Producers can hire a livestock buyer to purchase animals on their behalf. This option can help producers find animals that meet their specific set of criteria and increase the number of available animals across states or nationwide due to the livestock buyer's connections within the industry.

For any purchasing option, you will also need to plan how to transport the animal from the site of sale to your farm. Producers may have their own truck and trailer to provide their own transportation or can contract an animal hauling service. Action barns or species/breed associations often have a list of livestock haulers. For more information on agriculture-related transportation safety, read this **guidebook on transportation guidelines in Michigan.**



SECTION 3

Pre-purchase Considerations

Health Checks and Testing

Before purchasing and bringing livestock to your farm, it is wise to have a health check performed by a licensed veterinarian to assess the health of the livestock. Some producers may be able to provide documentation of health records.

Pedigree and Production Data

Access to a pedigree, production, or genetic data will provide producers with greater insight. Production data can give producers an idea of what the animal's phenotype and genotype are and how they will impact their production goals

If purchasing registered livestock at the time of sale make arrangements for the official registration to be transferred.

Required Identification and Travel Documents

When purchasing livestock, be sure they have federally/state regulated identification, if needed, before transport. Animals crossing state lines are required to have a Certificate of Veterinary Inspection. More information **can be found here.**

Securing a Bill of Sale

When purchasing livestock be sure to always obtain a bill of sale. A properly completed bill of sale should include the seller's and buyer's information, animal descriptions or identification numbers, purchase price, date of sale, and any health certifications or guarantees. Keep copies as part of your permanent farm records. A bill of sale may need to be provided to an insurance company for liability and coverage needs or for income tax purposes.



PROCURING ANIMALS

COMMON QUESTIONS

01 How do I prove ownership of newly acquired animals?

This can be done with a properly completed bill of sale. Registered animals may have a registration transfer form.

02 What should I consider when deciding which animal to buy?

After producers decide upon their production goals, they should select animals that meet their needs. Any livestock that are being considered for purchase should be sourced from a healthy herd/flock that is free from disease.

03 Are there any regulations when purchasing livestock?

There may be health regulations governing animal movement. Unless livestock are sold with a written guarantee, they are generally sold “as is” and “where is”.

04 How do I know if the animals I want to purchase are healthy and up to date on vaccinations?

You can ask the previous owner for veterinary records and be sure to purchase from a reputable source. Producers can employ the assistance of a veterinarian before or after a sale to identify the health status and future recommendations.

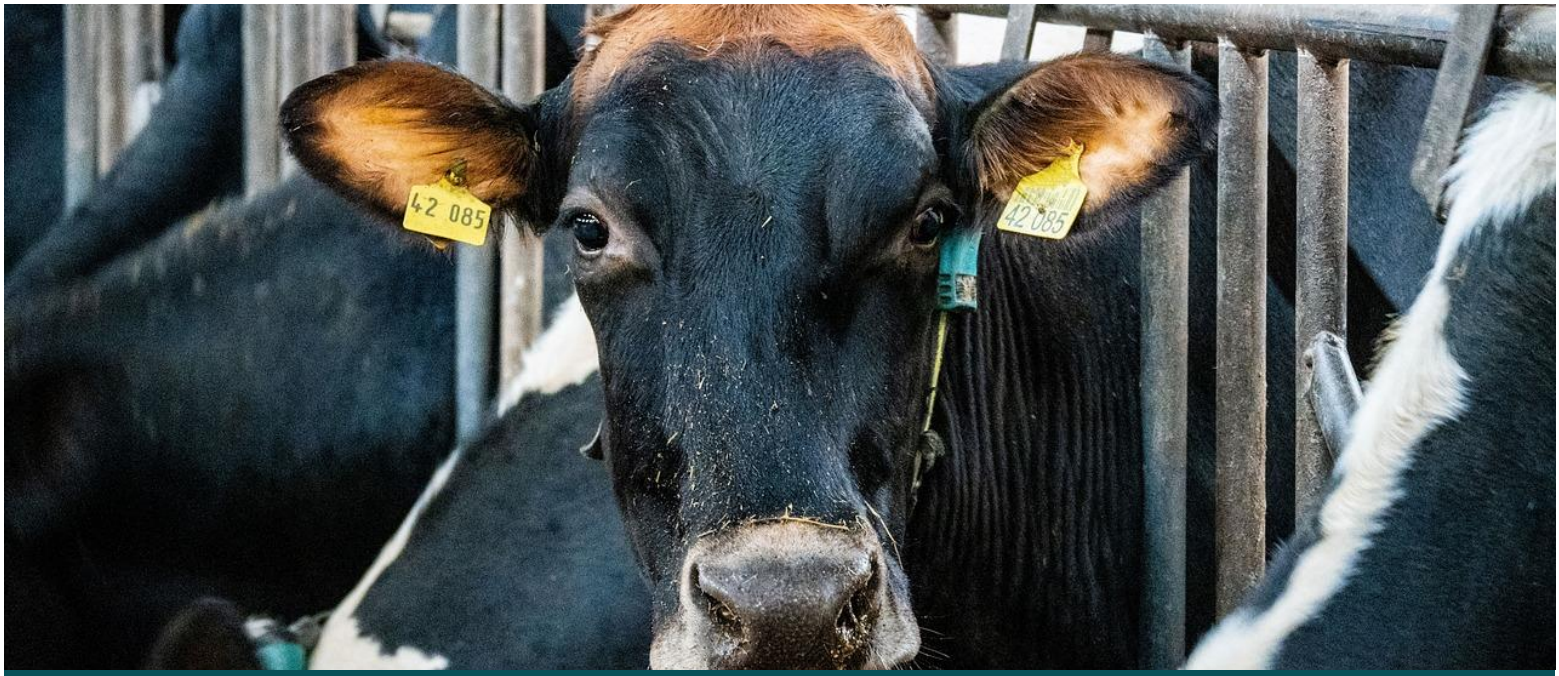
05 What’s the best way to get my newly purchased animals to my farm?

You can provide your own transportation or pay a livestock hauler for delivery.

Necessary resources and Partners – Please see Livestock Resources and Partners Appendix at the end of this chapter.

LIVESTOCK

Recordkeeping for Beginning Farmers



AUTHORS & INSTITUTIONS

Michael Metzger, Small Ruminant Educator, Michigan State University Extension

Katie Ockert, Community, Food, and Environment Educator, MSU Extension

Casey Zangaro, Swine Educator, MSU Extension

SECTIONS

Section 1: Recordkeeping for Beginning Farmers

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



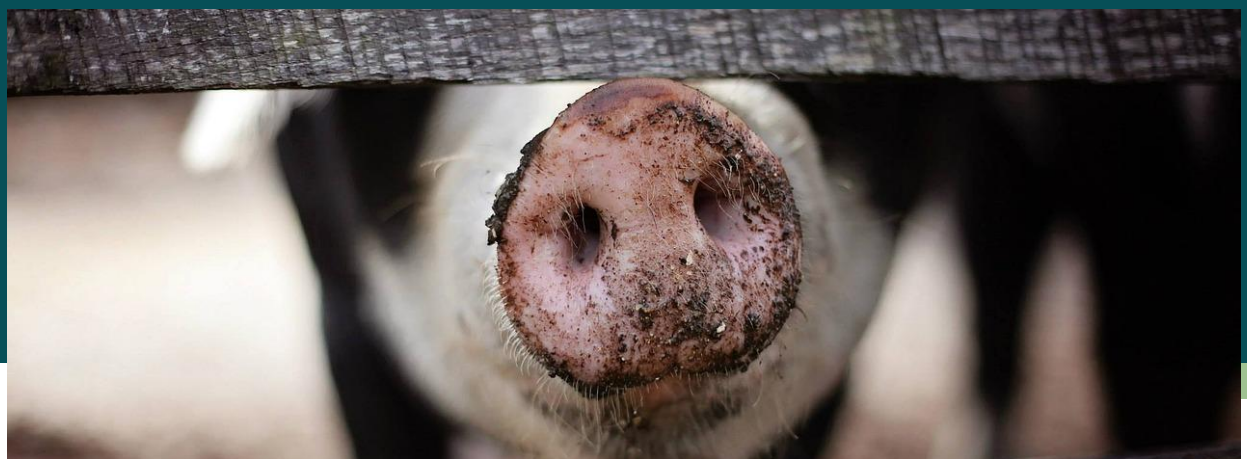
INTRODUCTION

Recordkeeping is the foundation of livestock production that separates successful operations from those that struggle. Records capture the details that will make decision making easier and help operations save money, time, and ultimately build a more profitable venture.

How To Get Started with Farm Recordkeeping

Begin with the basics: these are the areas to focus on first, which could include animal health, feed costs, financial, and production data. The key is to start simple and build gradually as you identify further needs. Remember, financial records need to be kept for income tax purposes.

There are different ways to keep records ranging from basic pen and paper to sophisticated computer/phone applications. Choose what is most comfortable and easiest for you to maintain.



SECTION 1

Recordkeeping for Beginning Farmers

Primary Considerations for Livestock Recordkeeping



Livestock can be purchased through different avenues, and each option will have its own advantages and disadvantages. Remember that all newly purchased animals should be isolated from animals already on the farm to protect from potentially spreading diseases (please reference the Health Management and Disease Prevention section for more information).

Critical questions

Before recording any information, ask yourself these three questions:

1. Will you use this information to make management decisions?

What is the value of the data being collected?. Ensure information is being collected accurately and utilized to assist in making informed decisions.

2. How will information be collected and recorded?

Deciding on what system or method your operation will use can help you determine the best way to store the data. Producers can use pen and paper notebooks, spreadsheets, or computer-based systems to record their data. Regardless of what system is chosen, it must be easy for the producer to input and maintain accurate data.

3. How are you analyzing and interpreting collected data?

Depending on the type of analysis you want, you may consider using:

- Spreadsheets to analyze numbers, such as feed costs or rate of gain.
- Expected Progeny Difference (EPD) data to assist in making breeding decisions.
- Health data to assist producers in medication inventory, vaccination schedules, withdrawal times, and individual animal health history.

There are various computer programs that may integrate some or all of this data.

The Process for Getting Started

Step 1: Choose Your Recording Method

- **Digital options:** Smartphone apps, cloud-based software, or computer programs
- **Physical options:** Notebooks, barn cards, or wall charts
- **Hybrid approach:** Collect data physically, then transfer to digital systems

Step 2: Establish Your Categories

The categories outlined below offer an extensive list of potential recordkeeping options. Producers do not need to track everything. Focus on recording what makes the most sense for your specific production and financial goals. Consider working with experienced advisors such as veterinarians, Extension Educators, or seasoned producers who can help you determine which metrics will be most valuable for your situation. Some livestock breed organizations/associations may have recordkeeping tools that could assist you in animal data management.

General Animal Information

- Date of birth, sire, dam, offspring lineage
- Ear tag number, tattoos, microchips, and/or barn name
- Registered name (for breeding or show stock)
- Purchase information: source, date acquired, purchase price, transport costs
- Physical characteristics: breed, color, markings, horn status
- Insurance information and coverage details

Health Records

- Genetic testing and EPD data
- Veterinary care: surgeries, hoof trimming, disbudding/dehorning, castration, dental work
- Preventive care: vaccination schedules, deworming protocols, implants, hoof care routines
- General health: non-life-threatening injuries, lameness incidents, body condition scoring
- Medications: vaccines (product, batch number, expiration date, withdrawal times), antimicrobials (dosage, method of delivery, treatment duration), pain management, and supplements
- Diagnostic testing: blood work results, pregnancy checks, disease testing (TB, Brucellosis, etc.)
- Mortality records: date, cause of death, necropsy results, disposal method

Reproduction Tracking

- Breeding management: estrus cycles, breeding methods (natural service, AI, embryo transfer)
- Breeding dates, sire information, breeding technician details
- Pregnancy monitoring: confirmation dates, due dates, ultrasound results
- Calving/birthing: date, time, assistance required, complications
- Offspring details: offspring identification, birth weight, vigor scores, colostrum intake timing, and amount
- Weaning information: date, weight, method, stress indicators
- Reproductive problems: difficult births, retained placenta, breeding failures, cystic ovaries

Production Data

- Dairy: birth weight, milk yield, milk components (fat, protein, somatic cell count), lactation curves
- Beef: birth weight, weaning weight, average daily gain, feed conversion ratios, finish weight, carcass data (hanging weight, grade, yield)
- Poultry: Layers–egg production; Meat birds–average daily gain, feed conversion ratio, carcass weight
- Swine: litter size, weaning weights, feed efficiency, backfat measurements, finishing weights, carcass data (hanging weight, grade, yield)
- Small ruminants (sheep and goats): fiber production (fleece weight and quality), milk production, carcass data (hanging weight, grade, yield)

Feed and Nutrition Records

- Feed consumption: daily intake by individual or group, feed refusal amounts
- Feed inventory: types, quantities, storage dates, costs, supplier information
- Ration changes: dates, reasons, formulations, nutritionist recommendations
- Supplement administration: minerals, vitamins, additives, medication in feed
- Pasture management: rotation schedules, grazing days, forage quality testing
- Water consumption and quality testing results

Financial and Economic Data

- Income tracking: product sales, animal sales, breeding fees, show winnings
- Expense categories: feed costs, veterinary bills, equipment/facility maintenance, utilities, facilities, bedding, advertising, memberships, etc.
- Cost per animal: purchase price, breeding fees, daily feed costs, total cost of production, disposal costs
- Insurance
- Tax-related information



Faculty and Equipment Records

- Housing assignments: pen numbers, group compositions, moves between facilities
- Equipment maintenance: repair dates, costs, preventive maintenance schedules
- Facility modifications: upgrades, repairs, compliance improvements
- Environmental controls: temperature logs, ventilation settings, lighting schedules
- Utility usage: electricity, water, fuel consumption by facility and equipment

Environmental and Regulatory Compliance

- Manure management: application dates, nutrient content, field locations, weather conditions
- Water usage and quality: testing results, conservation measures, source monitoring
- Regulatory inspections: dates, results, corrective actions required
- Certification compliance: organic, animal welfare, quality assurance program requirements
- Environmental permits and renewals

Marketing and Customer Relations

- Customer information: contact details, purchase history, preferences
- Product delivery: dates, quantities, quality specifications
- Customer feedback: complaints, compliments, special requests
- Market channels: direct sales, auctions, processors, distributors
- Pricing strategies: seasonal adjustments, volume discounts, premium products

Competition Results (for those marketing animals based on show performance)

- Competition details: show dates, classes entered, placing, judge comments

Step 3: Create Your Data Collection Routine

- Set specific times for data entry
- Keep recording materials easily accessible
- Develop shortcuts and abbreviations for common entries
- Back up digital records regularly

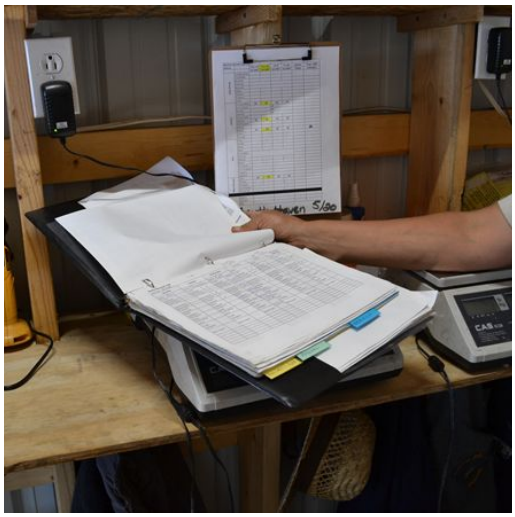
Step 4: Regular Review and Analysis

- Schedule monthly reviews of collected data
- Look for patterns and trends
- Identify areas for improvement
- Adjust recording methods as needed

Storing Records

Paper Records

For paper-based recordkeeping, maintain organized storage systems with reliable backup copies. This dual approach enables you to cross-reference information and identify important trends over time. Consider using fireproof filing systems or storing backup copies in a separate, secure location.



Combining Paper and Digital Records

Using both paper and digital records together creates a robust system for information verification. You can cross-reference entries between formats to ensure accuracy, catch potential errors, and maintain data integrity. This hybrid approach also provides additional security, as having information in multiple formats reduces the risk of total data loss.

Digital Records

When using digital data collection and storage programs, implement daily backup procedures to protect against system failures and ensure continuous access to your information. Automated backup solutions can streamline this process and reduce the risk of data loss.

Security Considerations

Be aware of the origin of data collection services and programs and who may have access to the data that is inputted.



RECORDKEEPING FOR BEGINNING FARMERS

COMMON QUESTIONS

01 What's the minimum I need to track to be successful?

Start with health records (vaccinations, treatments), basic production data (milk/eggs), and financial inputs (feed costs, veterinary expenses). These three categories provide the foundation for most management decisions and are often required for insurance or certification purposes.

02 How do I choose between paper and digital recordkeeping?

Consider your comfort level with technology, internet reliability, and where you will be recording data. Paper works everywhere but can be lost or damaged. Digital systems offer better analysis tools but require consistent data entry. Many successful producers use a hybrid approach: collecting data on paper in the field, then transferring to digital systems.

03 How long should I keep my records?

Health and treatment records should be kept for at least 3 years (required for food safety programs). Financial records should be kept for at least 7 years for tax purposes. Production records are valuable for trend analysis – keep at least 3-5 years to identify patterns. Some genetic or breeding records may have lifetime value.

04 What if I miss recording something or make a mistake?

No one is perfect. Estimate missing data when possible and note it as an estimate. Develop a system for handling gaps – perhaps a weekly review where you fill in missing information while the information is still fresh. The key is consistency.

05 How do I know if my recordkeeping system is working?

Evaluate your system by asking: Can you quickly find information when you need it? Are you using the data to make decisions? Has your recordkeeping helped you save money or improve production? If you're not using the data you collect, simplify your system to focus on actionable information.

Necessary resources and Partners – Please see Livestock Resources and Partners Appendix at the end of this chapter.

LIVESTOCK

Resources & Partners



AUTHORS & INSTITUTIONS

Michael Metzger, Small Ruminant Educator, Michigan State University Extension

Katie Ockert, Community, Food, and Environment Educator, MSU Extension

Casey Zangaro, Swine Educator, MSU Extension

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



General Resources

Body Condition Scoring (Swine, Dairy, Beef, and Horses):
https://www.extension.purdue.edu/extmedia/as/as-550-w.pdf

Body Condition Scoring (Goats):
https://www.nfacc.ca/images/codes-of-practice/goat/Appendix%20F%20-%20Body%20Condition%20Score%20for%20Meat%20Goats.pdf

Body Condition Scoring (Sheep):
https://extension.sdstate.edu/sites/default/files/2021-07/MC-02221.pdf

The Extension Foundation:
https://extension.org/

MDARD GAAMPS:
https://www.michigan.gov/mdard/environment/rtf/gaamps

Merck Manual:
Veterinary Manual

Michigan Right to Farm:
https://www.michigan.gov/mdard/environment/rtf

Partners

Michigan Department of Agriculture and Rural Development:
https://www.michigan.gov/mdard

United States Department of Agriculture–Animal Production:
https://www.usda.gov/farming-and-ranching/animal-science/animal-production

Species-Specific Resources

BEEF

Beef Quality Association
https://www.bqa.org/

Michigan Cattlemen's Association
Home (micattlemen.org)

MSU Beef Team
Beef (msu.edu)

PennState Extension
https://extension.psu.edu/animals-and-livestock/beef-cattle/production-and-management

Purdue University Extension
https://extension.purdue.edu/news/county/whitley/2022/07/understanding-agriculture-beef.html

U.S. Roundtable for Sustainable Beef
https://www.usrsb.org/learning-center

DAIRY

Michigan Milk Producers Association
https://www.mimilk.com/

MSU Dairy Team
https://www.canr.msu.edu/dairy/

National Dairy FARM Program
https://nationaldairyfarm.com/

The Dairy Alliance
https://thedairyalliance.com/farmer-resources

United Dairy Industry of Michigan
https://milkmeansmore.org/dairy-producers/

Upper Midwest Dairy Industry Association
https://www.umdia.org/resources/

POULTRY

American Pastured Poultry Producers Association
https://www.apppa.org/

eXtension Small and Backyard Poultry
https://poultry.extension.org/

Penn State University Poultry
https://extension.psu.edu/animals-and-livestock/poultry

Michigan Department of Agriculture & Rural Development–
Poultry Vet Contact Sheet

The American Poultry Association
https://amerpoultryassn.com/

SHEEP & GOATS

Maryland Small Ruminant
https://www.sheepandgoat.com/

Michigan Sheep Producers Association
Michigan Sheep Producers Association | MSPA

MSU Extension Sheep and Goat Website
www.canr.msu.edu/sheep_goats/

Scrapie Identification
Sheep and Goat Identification

SWINE

Iowa State University
https://www.extension.iastate.edu/smallfarms/swine

MSU Extension Pork
https://www.canr.msu.edu/pork/

Penn State University
https://animalscience.psu.edu/about/facilities/swine

Pork Gateway Information
https://porkgateway.org/

Pork Quality Association
https://porkcheckoff.org/certification-tools/training-certification/pqa-plus/

University of Maine
https://extension.umaine.edu/livestock/swine/

University of Minnesota
https://extension.umn.edu/swine/small-scale-swine-production

EQUIPMENT

Plastic, Drip-Layers, and Other Mulches



AUTHORS & INSTITUTIONS

Benjamin Phillips, Vegetable Specialist, MSU Extension

SECTIONS

Section 1: Plastic, Drip-Layers, and Other Mulches

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Plastic and Drip-Layers

Rolls of plastic that are 3 or 4 ft wide can be applied to the ground in rows with machines that lay the plastic flat on the ground, or can pack soil into raised beds. This film blocks weeds and can warm the soil for earlier or later production. Black plastic is most common and least expensive. The black plastic should be rolled out tight to the soil to create a mechanical transfer of heat from the sun to the soil. Infrared black plastic can be used to block all wavelengths of light except infrared, which plants and weeds don't use. This allows some solar energy to still heat the soil directly by passing through the plastic, but still prevents weed growth. White plastic with black on the reverse side is sometimes used for brassicas and onions, which do not need warm soils. Clear plastic allows the most light and heat, and allows for early seedings of sweet corn, but it must be vented or removed to avoid killing the crop from solarization. Weeds can also proliferate under clear plastic. Silver plastic is sold to prevent thrips and aphids. Other colors are sold with supposed benefits.

Once a plastic film is covering the soil, it holds moisture in the soil as long as it remains unpunctured. So, mulch-laying is commonly done in the spring when soil moisture levels are higher. Mulched beds are left alone until they are planted, holding spring moisture into the summer. Conversely, with a plastic film water infiltration from rain or overhead irrigation is prevented from reaching plant roots. So, drip tape is deposited under the plastic at the same time the mulch is laid.



The mulches need to be removed each year but are not easily recyclable because of how dirty they are. However, mulches can be made out of soil biodegradable materials that can be chopped up and tilled into the soil and will degrade over a four year period. Oxo- or photo-degradable films are designed to break down regular polyethylene plastic with catalyst materials that are mixed into the plastic itself. They essentially break down into microplastics. No soil biodegradable mulch has been approved for organic systems.

Plastic and drip-tape layers are made by companies like Rain-Flo, Reddick, Holland Transplanter, Mechanical Transplanter, and Buckeye Tractor Company. These machines most commonly shape one row at a time, but some models can shape three rows at a time with a high powered tractor. Most of the companies also sell plastic and drip tape that works best with those machines. Soil biodegradable mulch products include Bio360, BioAgri, EcoFilm, and others.

Other Mulches

Mulch type and timing can vary a lot! The challenge with the mulches below is applying them and keeping them applied in windy environments. Some handy tools that growers have found work best are chains, conduit, layflat hose filled with sand or pebbles, and sandbags.

Some growers like to use permeable woven polyethylene landscape fabric in large rolls. They roll it out and use a wand burner to melt holes for plants in some pattern. The burner is fired, extinguished, and then the hot metal tube is used to burn the hole. This cauterizes the cut and prevents the woven material from fraying. The mulch can be rolled up and stored to use again for a few years, and both overhead sprinklers and drip tape can be used to irrigate crops through the material.

Straw mulches work well but often become weedy from stray seeds in the straw. Growers have found that a base layer of paper or cardboard mulch under straw is more successful than straw alone.

Tarping with an impervious plastic material over a large area has become popular, but is not a true mulch unless it is left in the field while crop plants are growing. Tarps are frequently used to cover up soils in the fall or spring, to starve out weeds and as a termination step for cover crops.

After a few weeks, the area under the soil is ready for planting and the tarp is removed. With permanent bed systems, tarps can be cut into strips that fold up in the row middles, and unfold to overlap the beds like scales or shingles. With this method they are acting as a mulch for the row middles.

Living Mulches

Living mulches are live plants used to fill space between and around rows of crops. Like most biological systems, this is an attractive yet difficult system to perfect without careful fertility and irrigation dosing and placement for crops to offset the proportion of resources that the living mulches use.

How To Get Started

Start by talking to someone doing what you hope to do.

Perhaps go online and look up implements that you think would fit the scale of your operation, read their manuals and watch their instructional videos.

Then, go to a trade show or equipment dealership or a grower that has a lot of different things to learn more about its operation, support, and maintenance. Look for auctions and individuals selling used online.





SECTION 1

Plastic, Drip-Layers, & Other Mulches

Primary Considerations

- Determine what equipment you have for towing a bedder or mulch/drip-layer. They all require a three-point hitch for depth and draft control, but do not require power as they are ground-driven. Landscape fabric and tarps can be hand-applied.
- Do you grow individual rows of this and that all jumbled together all season long? Consider laying all your plastic in the spring and transplant or seed into it sequentially. You can lay out different colors for different crops and planting windows to moderate heat. When using cover crops between a complicated series of plantings, consider how tarping can be used to hold moisture, combat weeds, and terminate cover crops.

Process for getting started

- Define your market goals and how much area you might need to plant at a time. Does the size or shape of that area change throughout the year? This would help determine what amount and types of plastic you would need.
- Talk to a mentor.
- Research equipment online.
- Visit a trade show or dealership.





PLASTIC, DRIP-LAYERS, & OTHER MULCHES

COMMON QUESTIONS

01 How do I lay a plastic mulch and collect it up at the end of the season?

Specialized rollers are used to lay plastic tightly over the soil, along with drip tape. Most growers choose to invest in a machine for this. There are also machines that can lift and roll up old plastic, but many growers do this by hand.

02 How do I plant into mulches?

A method for landscape fabrics is described above. For rows of plastic mulch beds, it is common to use a tool to poke holes to place seeds or plants. Some of these devices are just hand tools, and others are more advanced machines for efficiently transplanting seedlings with less strain on your body.

03 Will weeds come through a mulch?

Some weeds will come through, including nutsedge and some strong perennial weeds. But, most weeds will not receive the signals to germinate until holes are made in the plastic for planting, or by accident (animals, hail, cultivation, hot oil from a tractor, etc). Most weeding will be reduced to between the bedded rows and for pushy weeds coming through the planting holes.

04 Isn't it good to keep the soil covered with living green plants, including weeds?

Growers have a wide range of tolerances for weeds and crop productivity. On the one hand, weeds are a part of the natural world striving to reclaim itself and reestablish stable soil microbiomes. On the other hand, weedy plants growing in and among your target crop plants often compete with the crop in some fashion, and mulching reduces that potential. Some plants, commonly sold as cover crops, are easy to establish and manage and can be used as between row-mulches or as vegetation to cover soil between crops, with less of a potential to build a weed seed bank.

05 Does plastic mulch harm the environment?

Traditional plastic mulch, oxo-degradable mulches, woven landscape fabrics, and tarps are made from polyethylene plastic, which degrades through physical and chemical means into smaller and smaller pieces of plastic. It never really goes away. Growers can attempt to recycle regular plastic mulch, but most recyclers will not take it unless oil prices are very high. True biodegradable mulches are made from compostable materials that microbes can consume over a period of about half a decade.

EQUIPMENT

Spreaders and Sprayers



AUTHORS & INSTITUTIONS

Benjamin Phillips, Vegetable Specialist, Michigan State University Extension

SECTIONS

Section 1: Spreaders and Sprayers

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Spreaders

Some granular and manure/compost spreaders are gravity-fed and ground-driven, meaning that a constant rate of material is delivered by gravity out of a feed gate, and a wheel running along the ground is attached to gears and chains that drive the rotor that displaces a fixed amount of granules per revolution. This locks the spreading rate to ground speed, as long as the feed gate is set at a consistent opening.



If the feed gate opening remains the same, then halving ground speed will not affect output, and doubling ground speed will also not affect output. If ground speed remains constant, then doubling the rate of granules released from the feed gate with a larger opening will double the output, and halving the rate of granules released from the feed gate with a smaller opening will halve the output.

Some granular and manure/compost spreaders have a metering unit that is independent from ground speed, and is run hydraulically, electrically, or through a hand crank or the tractor PTO. This allows for more advanced variable rate technology to modify application rates while traveling across fields. If the meter rate remains constant, then halving ground speed will double output, and doubling ground speed will halve output. If ground speed remains constant, then doubling meter rate will double output, and halving meter rate will halve output.

Rotary spreaders fling the material in a fan-like pattern to either side of and behind the spreader, drop spreaders and air booms release material in a sheet-like pattern straight down directly over the footprint of the spreader, and many of these can be modified to band granules along a row with deflecting plates or drop tubes or shanks for soil injection. There are pull-behind, 3-point mounted, and self-propelled options.

Liquid Manure Spreaders

In large animal operations, manure collection into pits generates a thick liquid manure product that can be spread by tankers with a broadcaster that makes a fan-like pattern with a high pressure pump and a deflecting plate, or with injectors that pump the liquid into the soil with manifolds, hoses, coulters and shanks. They are typically pull-behind units powered by PTO or hydraulically, though some are self-propelled.



Sprayers

Sprayers use a pump mechanism that runs independently from the tractor wheels, or your legs. They are often powered hydraulically, electrically, or through a hand pump, gas motor, or the tractor PTO. Variable rate technology can be used to modify the output on the fly while driving across a field.



If the pressure remains constant, then halving ground speed will double output, and doubling ground speed will halve output. If ground speed remains constant, then quadrupling pressure will double output, and quartering pressure will halve output.

Boom sprayers apply a sheet-like mist along the length of the boom or cover a series of narrow bands over rows with one or more nozzles grouped together, and are typically used in small-statured plants grown in fields or greenhouse tables. Airblast sprayers generate a high-pressure directional fog and are typically used in more permanent and vertical systems like orchards, vineyards, and hopyards, though some air-assisted boom sprayers exist as well. There are pull-behind, 3-point mounted, and self-propelled options. Wand sprayers have one or more hand-directed nozzles used for small or irregular shaped plants or plots, and some models can generate a fog or mist.

How To Get Started

Start by talking to someone doing what you hope to do.

Perhaps go online and look up implements that you think would fit the scale of your operation, read their manuals and watch their instructional videos. Then, go to a trade show or equipment dealership or a grower that has a lot of different things to learn more about its operation, support, and maintenance. Look for auctions and individuals selling used online.





SECTION 1

Spreaders & Sprayers

Primary Considerations

- Determine what equipment you have for towing or powering a spreader or sprayer. Some require a three-point hitch, and some are towed with a single hitch pin. Some require PTO, hydraulic, electric power, or a combination.
- Do you grow individual rows of this and that all jumbled together? Then a boom sprayer or rotary might not be the best tool for you. Those tools cover wide swaths of area and would treat all rows equally whether they need the attention or not. For a small operation growing a few beds at a time, a drop spreader, hand spreader, or wand sprayer would be a better option.

Process for getting started

- Define your treatable areas and how much area you might need to spread or spray over at a time. Does the size or shape of that area change throughout the year? This would help determine what sort of equipment you would use, or could result in re-arranging fields to accommodate a spreader or sprayer of certain dimensions.
- Talk to a mentor.
- Research equipment online.
- Visit a trade show or dealership.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SPREADERS & SPRAYERS

COMMON QUESTIONS

01 Do I really need something to spread or spray materials?

Better crop uniformity can be achieved when using technology that meters material onto the ground or crop at a predictable rate and spread pattern. Soil fertility and pest management inputs are expensive, and a good device and protocol for using them pays off.

02 How do I know how much material to use?

For soil fertility inputs, a soil test from MSU or another service provider would be most helpful to determine what amount of material to add to the soil. For pest management inputs, the Midwest Vegetable Production Guide is a good start. Once you know how much to apply per area, you then need to calibrate your sprayer or spreader to achieve that.

03 How do I calibrate?

Calibration involves measuring various combinations of speed, time, area, volume, and weight so that you deliver the proper amount of product to an area. The **following document** outlines some procedures for calibrating spreaders and sprayers.

04 When should I apply materials?

Soil fertility inputs are best applied in the spring before planting. However, when changing pH with lime or sulfur it is better to apply those products in the fall before a production year. For weeds, herbicides can be used before they emerge, or after they emerge. Fungicides are almost always used before symptoms are obvious, but conditions are good for disease development. Most insects can be managed after infestations have begun.

05 Is it safe?

All materials that you would spread or spray on a farm have risk levels associated with them. It's always a good idea to cover your skin when mixing, loading, or applying these materials. For dusty or splashy materials, a respirator and eye protection is also a good idea.

EQUIPMENT

Tillage



AUTHORS & INSTITUTIONS

Jenna Falor, Field Crops Educator, Michigan State University Extension

Jonathan LaPorte, Farm Business Management Educator, Michigan State University Extension

SECTIONS

Section 1: Tillage

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Tillage is the mechanical loosening, inverting, or mixing of soil. Tillage can affect many different aspects of production including managing weeds or plant residues, incorporating fertilizers, remediating compaction at the surface level, and establishing good seed-to-soil contact. The importance of each factor to your production goals may influence the tillage system you choose to use. Different types of equipment can be used to achieve each tillage goal, or a combination of goals, based on the depth and amount of soil disturbance.

How to Get Started

It's important to understand the conditions and characteristics of your fields when selecting a tillage system, as tillage systems are not "one size fits all". Soil characteristics, including physical properties, slope, and moisture need to be considered. Crop rotation and management (i.e., organic crops will require more tillage) may also be factors in determining the ideal tillage systems for your fields.





Another consideration for tillage equipment would be matching the implement to the appropriate tractor. Many tillage implements require a certain amount of horsepower and some require an optimal speed for effective performance. Consider what equipment you already have or may need before settling on any specific tillage implement.

Once a tillage system has been identified, the next step is to determine which implements will be needed. Tillage equipment, or implements, can often be expensive and require a large amount of capital to buy. Used equipment may be more economical upfront than newer equipment. However, used equipment may require extensive repairs to restore them to peak operating ability or into a condition that is good enough for what you want, even if you are not after peak performance. If finances are limited to purchase equipment, another alternative is to hire other farms that offer custom tillage or planting services.



SECTION 1

Tillage

Primary Considerations

- Types of tillage systems
- Types of tillage equipment and their functions
- Advantages and disadvantages of tillage

Process for Getting Started

Types of Tillage Systems

Tillage systems can be generally classified into three categories: conventional tillage, reduced tillage, or conservation tillage.

In **conventional tillage**, there is a higher degree of soil mixing or disturbance. Sometimes referred to as primary tillage; equipment often includes plows, disks, sub-soilers, or even rotary tillers.

In **reduced tillage**, at least one or more operations in conventional tillage are removed. Often the more aggressive forms of tillage, such as plowing. In some instances, lighter tillage equipment is used in place of heavy-duty implements. Examples include light to medium size disks, field cultivators, rollers, or soil finishers. Note: the terms “minimum tillage” or “secondary tillage” are often associated with reduced tillage.

In **conservation tillage**, a minimal amount of soil mixing or disturbance is seen and at least 30% of the soil surface has crop residue coverage. The goal is to keep crop residues on the soil surface to reduce erosion, improve water infiltration, and enhance soil health. A few examples of conservation tillage include no-till, strip tillage and vertical tillage.



Strip tillage

- ***No-till practices*** use a planter designed to create a narrow opening to place seeds in the ground without soil mixing or turning. No-till systems do not include physical soil disturbance before or after planting.
- ***Strip Tillage*** uses a strip tiller machine and only tills the ground where the seed bed will be leaving the area in between the rows undisturbed.
- ***Vertical Tillage*** uses a vertical tillage machine, and it cuts up, or “chops”, crop residue and lightly tills the top 1-4 inches of soil. This kind of tillage moves the soil vertically rather than sideways.

Types of Tillage Equipment and Their Functions



Soil finisher

There are different types of tillage equipment or implements. Each implement performs a different type or combination of types of tillage in a field. It's important to understand what each implement does and which type of tillage system it is associated with.

Plows

An aggressive form of tillage that inverts or turns the soil over. Soil depth for plows can be 6-16 inches deep and may leave large soil clods or aggregates. Additional tillage is often needed to finish preparing the soil before planting.

- ***Moldboard*** – Inverts soil leaving very little surface residue, deeper tillage method (8-12 inches) and typically occurs in the fall.
- ***Chisel (straight or twisted shank)*** – Less aggressive than moldboard plow and can leave 40—45% residue, has a row of coulters or disks to break up residue and then has shanks that are staggered to work the subsoil.

Disks

This type of tillage implement cuts through the soil and buries part of the crop residue. They can be used to break up the soil surface or used in deeper tillage similar to a plow. Depending on the shape and type of disk, it can leave a smooth surface.

- ***Disk Ripper*** – Tills at a depth of 12-16 inches with a set of disks, followed by shallow shanks and then deep shanks. Can leave 35-45% residue coverage.
- ***Disk*** – Tills at a depth of 5-8 inches, unlike a disc ripper this does not have shanks.



Disk ripper

Cultivators



Field cultivator with rolling basket

A field cultivator can be used as a primary or secondary tillage tool to bury crop residue, control weeds, loosen the soil, mix in products, and prepare the seedbed. Field cultivators affect the entire surface of the soil they pass over at a depth of 5 inches or less. Another type of field cultivator is a row cultivator. Row cultivators only impact soil between crop rows and are used to remove weeds or apply fertilizers in-season.

Harrows

A harrow is a secondary tillage tool used to level the soil surface, redistribute surface residue, break apart soil clods, and disturb weed germination. These types of tillage equipment can be used independently or attached to the rear of disks, field cultivators, or drills.

Finishers

Soil finishers are another type of tillage implement that combines several tillage operations into one tool. They are used to finish preparing the seed bed before planting. Disking, field cultivating, and soil leveling implements are commonly seen on soil finishers.

Vertical Tillage Tools

Tillage equipment used to mix the soil vertically not horizontally. This can include subsoilers, disk chisels (not true vertical tillage), chisel plows with vertical points, or secondary spike tooth harrows. For more information on vertical tillage, visit **North Carolina State's Vertical Tillage website** (https://soilmanagement.ces.ncsu.edu/tillage-management/vertical-tillage).

Planters



Planter

Planters utilize light soil disturbance to place seed in the soil. Single or double disk openers cut through surface residue to open a slot in the soil for seed placement. Row cleaners may also be equipped to physically move crop residue away from the seedbed. They are common on many planters, including no-till planters, to aid the planting process. Coulters may also be used to assist in creating a wider slot in the soil for planting.

For more information on types of tillage equipment, review the University of Minnesota's **The purpose and ideal uses for tillage implements** (https://extension.umn.edu/soil-management-and-health/tillage-implements-purpose-and-ideal-use).

Also, review USDA's **Tillage Equipment Pocket Identification Guide** (https://downloads.snapplus.wisc.edu/nrcseprd1323703.pdf).

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



TILLAGE

COMMON QUESTIONS

01 Is it considered a conservation tillage system if I use reduced tillage for a crop one year and no-till for another crop the next?

No. If no-till or other conservation tillage practices are used on only some crops in a rotation, the field is not considered to be in a conservation tillage system. For example, a field cultivator is used prior to planting corn in a field. The next year, soybeans are planted with a no-till planter in the same field. Because a field cultivator is used in the field's crop rotation, a reduced tillage system rather than a no-till system would be a more appropriate description.

02 What are the advantages of tilling?

Tillage loosens the soil for planting, controls weeds, incorporates fertilizer and organic matter, and can improve soil temperatures in the spring.

03 What are the disadvantages of tilling?

Tillage can create soil compaction, breakdown soil structure, disturb soil life (worms, fungi, microbes) important to soil health, and loss of moisture from drying out soils.



RESOURCES & PARTNERS

Necessary Resources

- Corn Tillage Systems (University of Wisconsin Madison)
  https://corn.agronomy.wisc.edu/Management/L007.aspx
- Definitions of Tillage Systems for Corn (University of Nebraska-Lincoln)
  https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1247&context=biosysengfacpub
- Fall-Tillage Tips for Vegetables (MSU Extension)
  https://www.canr.msu.edu/news/fall_tillage_tips_for_vegetables
- Farmer Field Schools reference material on tillage from the Food and Agriculture Organization of the United Nations
  https://www.fao.org/fileadmin/templates/nr/images/resources/pdf_documents/tillage_module.pdf
- Lessons from Long Term Research: Comparing No-Till to Conventional Tillage Over 30 Years (MSU Extension)
  https://www.canr.msu.edu/resources/lessons-from-long-term-research-comparing-no-till-to-conventional-tillage-over-30-years

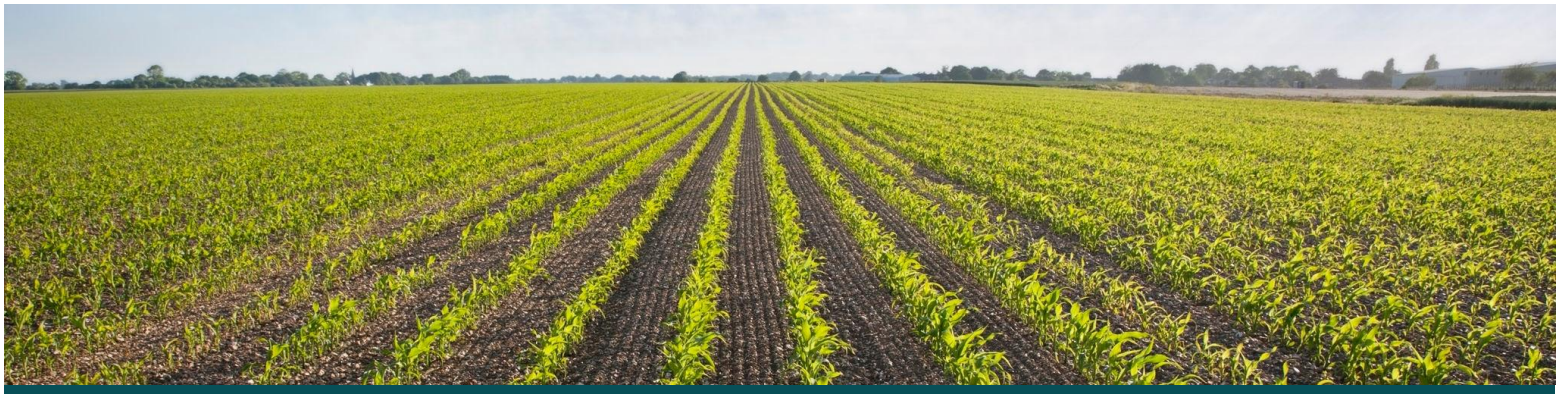
- The purpose and ideal uses for tillage implements (University of Minnesota) https://extension.umn.edu/soil-management-and-health/tillage-implements-purpose-and-ideal-use
- Tillage in Michigan Soybean Systems (MSU Extension) https://www.canr.msu.edu/videos/tillage-in-michigan-soybean-systems
- Tillage Management (NC State Extension) https://soilmanagement.ces.ncsu.edu/tillage-management/
- Upper Midwest Tillage Guide https://www.swiftswcd.org/uploads/9/8/2/9/98296824/upper_midwest_tillage_guide.pdf
- USDA Natural Resources Conservation Service (NRCS) Tillage Equipment Pocket Identification Guide https://downloads.snapplus.wisc.edu/nrcseprd1323703.pdf
- USDA Natural Resources Conservation Service (NRCS) Tillage Practice Guide https://mssoy.org/sites/default/files/documents/tillage-practice-guide-five.pdf
- Vertical Tillage for Corn Residue Management (MSU Extension) https://www.canr.msu.edu/news/vertical_tillage_for_corn_residue_management

Partners

- USDA Natural Resources Conservation Service (NRCS) https://www.nrcs.usda.gov/

EQUIPMENT

Transplanters and Seeders



AUTHORS & INSTITUTIONS

Benjamin Phillips, Vegetable Specialist, Michigan State University Extension

SECTIONS

Section 1: Transplanters and Seeders

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Seeders and Transplanters are both used to place plant material into the ground at a consistent spacing. Seeders place seeds, or seed-pieces, and transplanters place small seedling plants.

Seeders

All seeders pick up seed from a hopper, drop it into the ground at an adjustable depth and cover it. However, there are different styles of meters that are used to space that seed out within the rows. They all strive to dribble or singulate seed at specific depths and spacings. They can be tractor mounted or some can be used on foot.



Walking stick planters, such as the Stand 'n Plant, are great for small acreages of large spaced crops, large-seeded crops, and even tighter spaced, large-seeded crops. They also work well for poking seeds through plastic mulch.

Gravity-fed roller-style (Jang JP) or belt-style (Stanhay) seeders, are for small acreages, and can be set up to plant one or multiple rows at a time or tractor mounted. They are good for dense small-seeded crops. They use interchangeable rollers or belts with indentations in them to scoop seed out of a seed hopper and meter them out with a drive wheel and gearing. Johnny's Six-Row Seeder, Four-Row Pinpoint Seeder, and Glaser wheel hoe seeder attachment are also good with small-seeded vegetables for small scale farms. There are both push units and tractor-mounted units available.

Gravity-fed plate-style seeders, such as the Jang TD, Hoss Garden Seeder, and Earthway Seeder are good for larger-seeded and some small-seeded crops. They use interchangeable plates that scoop seeds of different sizes out a seed hopper and meter them out with a drive wheel and gearing. These are the standard for smaller scale vegetable operations, with a huge number of plates for any seed size or shape. However, they lack reliable singulation of small seed. There are both push units and tractor-mounted units available.

Another type of gravity-fed plate-style seeder is a Planet Jr., which uses a stationary plate and a rotating agitator driven by the front wheel that wiggles inside the seed hopper to dribble seed into a hole in the plate. The plate itself has holes of several sizes that can be repositioned for crops with different seed sizes. This type of unit does not singulate at all, but makes a line of seed that needs thinning later. There are both push units and tractor-mounted units available.

Finger pickup seeders, such as the John Deere 7000 use metal tines to scoop seeds out of a hopper. They are limited to about 12 tines of one size for large and round seeds. Some growers remove every other metal finger to plant pumpkins. They are singulated with a brush. In-row spacing is determined by how fast it spins. Older units use a drive wheel and gearing, and new models use hydraulic or electric systems to meter seed independent of ground speed. Many row units can be added to a toolbar. There are only tractor-mounted units.

Vacuum and plate-style seeders use a plate with holes drilled in it and a vacuum to suck seed from a hopper onto the plate. They are singulated with metal tabs. In-row spacing is determined by how fast the plate spins, the number of holes on the plate and vacuum pressure. Older units use a drive wheel and gearing, and new models use hydraulic or electric systems to meter seed independent of ground speed. Many row units can be added to a toolbar. These are the standard for larger scale vegetable operations, with a huge number of plates for any seed size or shape and a gold-standard for singulation. Many companies make them, including Monosem, John Deere, Stanhay, and Wizard. There are both push units and tractor-mounted units available.

Seeds can also be placed in soil under plastic mulch with special tools. The aforementioned walking stick planters work well for this in small scales. For larger scales, a push-style Poly Planter Jr. or tractor-mounted Drum Punch Planter or Poly Planter combine vacuum seeder technology above with a dibbling mechanism that rolls and pokes holes in plastic for depositing seed.

Transplanters

All transplanters open the soil, insert a plant and some tamp soil around the plant. However, not all transplanters are equal for all applications. The oldest style of transplanting is using a hoe to make a hole, placing in a plant, and packing it in with your feet or hands.



A walking tube-style hand transplanter is good for expanding gardens into higher production acreage. They go by names like Stand 'n Plant, and Pottiputki.

Waterwheel transplanters can be used on bare ground and plastic beds. They roll drums along the ground with triangular inserts that determine in-row plant spacing like a dibble. You can add a drum to do closely-spaced twin-rows. Water is gravity fed into the drums, then pours out of the hole where the triangles are, and you stick your transplant right into the water-soaked hole. Note, if you use any fertilizers or chemicals in the transplant water, workers should wear gloves. Sometimes it helps to send someone behind the transplanter with a hoe or shovel to make sure the transplants are fully-seated and covered with soil. Most of these straddle one row and seat one to four people.

Finger-style transplanters do not function on plastic beds because they have a disc-opener and shoe to make a furrow like a traditional seeder that would slit the plastic. They have been traditionally used for evenly balanced bare root-stock without a weighted-end (asparagus, hops, strawberries, sweet potatoes, onions, cole crops). These transplanters work by two metal fingers that pinch a leather or rubber strap like a baseball mitt's pocket. The fingers open the pocket for a worker to place a transplant, and pinch closed on it as it brings the transplant down into the furrow. These finger units are arranged in a series like the teeth of a chainsaw and a ground drive-wheel is geared to adjust in-row plant spacing. Water is gravity fed into the furrow as the transplant goes in. Chemicals can be added to this water without workers needing to touch it and there are closing wheels to pack the plant in. Finger-style transplanters do not handle "weighted-end" transplants well as the soil plug can clog up the slot where the finger grabbers pull the transplant through to the ground. They may be amenable to a reduced-tillage situation if a strip-tiller preceded it.

Carousel transplanters do not function on plastic beds for the same reasons as a finger-style transplanter; they cut a slit in the soil. They are excellent for plug-tray transplants, with a weighted-end. When the discs open a furrow, the transplant in the revolver tube is dropped in like a lawn dart and water is gravity fed in with it. A ground drive-wheel is geared to adjust in-row plant spacing. Chemicals can be added to this water without workers needing to touch it, and there are closing wheels that pack the plant in. These do not work very well for bare-roots transplants without a weighted-end. They may be amenable to a reduced-tillage situation if a strip-tiller preceded it.

Cup-style transplanters are designed for transplanting into plastic rows, but also work on bareground. These can be set up to transplant in close double-row configurations similar to a water wheel transplanter. A ground drive-wheel is geared to adjust in-row plant spacing. Chemicals can be added to this water without workers needing to touch it, and there are closing wheels that pack the plant in. They may be amenable to a reduced-tillage situation if a strip-tiller preceded it, but the cups need a soft soil to open properly.

PaperPot transplanters are perhaps the newest transplant systems. The PaperPot system utilizes specially-folded paper that accordions into a full transplant tray with 264 cells which are then packet with transplant media and seeded as you would normally start transplants. A special transplanting unit that you pull across the ground on foot deposits the special paper cell trays into the soil in a continuous chain of equally-spaced plants every 2, 4 or 6 inches. This system does not have a water injector, and needs to have a well-prepared soil before it can be efficiently pulled.

PlantTape and Agriplant NV transplanters bring the PaperPot concept to a larger scale. Though they work differently, when transplants are ready, they can be planted into one to eight rows and metered out to the desired population. The TTS transplanter can plug and place transplants from standard cell trays for automatic transplanting. In all cases these automatic transplanters only work in bare soil situations.

Bulb and Tuber Planters

Somewhere between seeds and live growing transplants are dormant bulbs and tubers like garlic and potatoes. These can be planted similarly with deeply-poked holes made with hand tools, or with middle-buster plows to pull a trench with a tractor.



Seed pieces can be dropped in by hand and a foot used to kick soil over them. Waterwheel transplanters can also work in a pinch.

More advanced systems combine the trenching, seed piece-dropping and burying in one smooth process.

Consistent seed piece size is important for proper mechanical planting. They are typically a ground-driven device with a large hopper and a series of cups on a chain that lift individual seed pieces from the hopper and drop them down a tube, a bit like a roller coaster. Brands include Garmach, Spedo, Spudnik, Willsie, and many more. The old Iron Age potato planter works just like a finger pickup seed hopper with a gravity feed hopper that concentrates seed pieces near a rotating finger wheel that lifts and carries seed to a drop point.

There are also assisted-feed planters from the US Small Farm Equipment Company that use a mechanism similar to a carousel transplanter to ensure that a seed piece is placed in every spot without skips or doubles. It requires a person to sit on the back and place the seed pieces.

How To Get Started

Start by talking to someone doing what you hope to do.

Perhaps go online and look up implements that you think would fit the scale of your operation, read their manuals and watch their instructional videos.

Then, go to a trade show or equipment dealership or a grower that has a lot of different things to learn more about its operation, support, and maintenance. Look for auctions and individuals selling used online.





SECTION 1

Transplanters & Seeders

Primary Considerations

- Determine what equipment you have for towing or powering a seeder or transplanter. Most require a three-point hitch at a minimum. Some require PTO power, and some are towed with a single hitch pin.
- Do you grow individual rows of this and that all jumbled together? If so, then a push-style seeder, with several interchangeable plates, belts, or rollers might be best for you. Tractors can carry many row units for large plantings with the same spacing.

Process for getting started

- Define your market goals and how much area you might need to plant at a time. Does the size or shape of that area change throughout the year? This would help determine what sort of equipment you would use, or could result in re-arranging fields to accommodate a seeder or transplanter of a certain design.
- Talk to a mentor.
- Research equipment online.
- Visit a trade show or dealership.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



TRANSPLANTERS & SEEDERS

COMMON QUESTIONS

01 Why is seed singulation and seed placement important?

Having seeds or plants in a predictable location along a row and between rows allows for predictable weed control and yield estimations later on.

02 How do I know how much seed or plant material to plant?

The best way to understand what amount of product to grow is to know your markets. Once you understand what your production benchmarks need to be for a given set of days, weeks, or months, you can plan backwards from those target dates to account for growth time, greenhouse time, or germination time. Once you know your output goals and your area, you need to calibrate your seeder or transplanter.

03 How do I calibrate?

When using a new seeder or transplanter, consult the manual and stickers affixed to the units. You can check against the documentation provided by lifting a seeder over a bucket, and spinning the drive wheel one full revolution to catch seed. Measure the circumference of the wheel in inches and divide by 12 to get ft per revolution. Then divide the number of seeds caught by the feet per revolution to determine seeds dropped per foot. Small seeded crops need to be closer to 9-12 seeds per foot, and larger crops need to be closer to 1-6 seeds per foot.

04 When should I seed or plant?

Warm-season crops need soils to be over 50 degrees F. Cool-season crops can be seeded or transplanted with soil temps in the 40's.

05 Can all seeders plant all types of seeds?

No. Each seeder has its own tolerances for seed size or shape, but all seeders will handle spherical seed well. The metering parts of vacuum seeders, belt seeders and roller seeders can be shaped so that flat, pointy, or oblong seeds can pass through, but they do not singulate them very well. For smaller growers, Earthway push seeders work best for larger seed, and Jang seeders work best for smaller seed.

ORGANIC

Organic Farming



AUTHORS & INSTITUTIONS

Kim Williams-Guillen, Washtenaw County Conservation District

Katie Brandt, Beginning, Urban, Sustainable & Small Farms Educator, Michigan State University Extension

SECTIONS

Section 1: Organic Crops

Section 2: Organic Livestock

Section 3: Organic System Plans

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Why Organic?

Organic farming focuses on creating healthy, resilient farm ecosystems. Instead of relying on synthetic fertilizers and pesticides, organic farmers build soil fertility, manage pests naturally, and maintain productivity through thoughtful practices. Techniques like crop rotation, cover crops, natural pest control, and planting diverse crops all work together to treat the farm as a connected ecosystem.

Organic farming itself is different from organic certification. Certification is the official USDA process that verifies a farm follows national organic standards, keeps detailed records, and passes annual inspections. Some farmers use organic methods without certification, while others seek the USDA Organic label to access certain markets or assure consumers. Simply put, **organic farming is the *practice,* and organic certification is the *proof***.

Farmers choose organic farming for many reasons. Some aim to protect the environment. Others are drawn by market demand and higher prices. Many are motivated by personal or community values, like promoting health, sustainability, and transparency.

Understanding Organic Rules

The United States has clear, legally defined rules for how organic crops and livestock are grown. The USDA National Organic Program (NOP) publishes and maintains these standards, which are detailed guidelines designed to protect the integrity of the organic label.



For crops, that means no synthetic fertilizers, pesticides, or genetically modified organisms (GMOs). Farmers must build soil fertility through natural methods like composting, cover cropping, and crop rotation. Seeds must be organic when available, and every input used – fertilizers, weed treatments, and pest controls – must be approved for organic production.

The **organic standards for livestock** focus on animal welfare and living conditions. Animals must be fed 100% organic feed and have access to certified organic pastures and outdoor spaces, managed without any synthetic inputs. Ruminants must eat a certain amount of their diet as fresh pasture or hay. Organic livestock can't be treated with antibiotics, hormones, or synthetic antiparasitics. This doesn't mean that organic farmers leave those conditions untreated; sick animals must be treated humanely with appropriate medications, even if doing so means they lose their organic status.

Organic certification for crops and livestock requires detailed and comprehensive recordkeeping, annual inspections, and the development of an Organic System Plan (OSP) that lays out exactly how the farmer meets every rule and requirement. At every step, from soil to sale, a farmer must be able to document how they maintain organic integrity.



Here are some resources that might be helpful in transitioning your farm to organic:

- Excellent collection of dozens of good resources for organic rules and recordkeeping: https://www.ams.usda.gov/services/organic-certification/organic-records
- https://carolinafarmstewards.org/resources/organic-certification-and-production-guide/
- Workbook with great info for transitioning to organic: https://www.sare.org/resources/organic-transition/

How to Get Started

Find Resources and Support

Michigan's Transition to Organic Partnership Program offers many supports for farmers shifting to organic, including mentors, events and/or resources.

Transition Your Land to Organic Management

Any farmer can use organic practices, but that's only the first step toward certification. Before contacting a certifier, it's important to understand your land's history and how certification fits into your business plan.

To be certified organic, your land must be free of prohibited inputs like synthetic fertilizers, pesticides, and GMO seeds for at least three years. If you've used those inputs recently, you'll need to farm organically for a three-year transition period before becoming eligible. Some certifiers even offer "transitional" programs to recognize farms working toward full certification.

If you've managed your land for less than three years, you can still qualify by verifying its history. Ask the previous owner or manager to sign a land use affidavit confirming that only organic-approved inputs were used.

Assess Your Needs



Farmers learning about organic soil management at a Transition to Organic Partnership Program event

Just as your land must be ready for certification, you need to be ready too. Organic certification isn't the right fit for everyone: it comes with paperwork, recordkeeping, and costs. In most cases, you can't market your products as "organic" without certification, which protects the integrity of the USDA Organic seal.

Organic Exempt

The one exception is for farms earning less than $5,000 a year in organic sales. These farms can use the word "organic" if they follow all USDA rules, but they can't use the official seal.

What label is right for my markets?

Smaller farms that sell directly to customers (through farmers markets, CSAs, or farm stands) might skip certification because they can build trust through personal relationships. But for farms that want to sell to wholesalers, grocery stores, schools, or food hubs, certification is a valuable credential. It gives buyers confidence when they can't meet the farmer in person.

Certification Steps

Choose a Certifier



Each certifier has their own seal, in addition to the USDA Organic seal shown at the top left of this page

Once you are ready, the first step is to **choose an accredited certifying agency** (public or private) to work with. An organic certification agency is a third-party organization, accredited by the USDA National Organic Program, that verifies a farm complies with organic standards. It does this by reviewing applications, conducting on-site inspections, and issuing certifications.

Complete an Organic System Plan and Submit Paperwork

Once you have chosen a certifier, **you will use their templates** to complete an Organic System Plan (OSP); this is a detailed description of how your operation meets organic requirements. The OSP covers everything from seed sourcing and soil management to animal welfare, pest control, and recordkeeping. Different certifiers have slightly different formats for putting together the OSP, so make sure to review the templates your certifier provides. Most certifiers working in Michigan require applicants to submit paperwork between January and April. You will also pay an application fee and a deposit towards your inspection costs.

You can use the OSP Template from your certifier or use one of the USDA templates below:

- OSP Template – Organic Production (docx)
- OSP Template – Crop Production (docx)
- OSP Template – Livestock Production (docx)

Certification Inspection

After you submit your application, a certification inspector visits your farm to verify that your practices match your plan. The certifier reviews the inspection report, and if everything checks out, you're approved to market your products as USDA Certified Organic. Inspectors will usually want to visit your farm while it's in production season, in order to observe your methods and processes. Depending on when you submit your application and when your inspector visits, it usually takes 3-6 months from application to certification. When an inspector visits your farm, you should be prepared to do the following steps and answer the following questions:

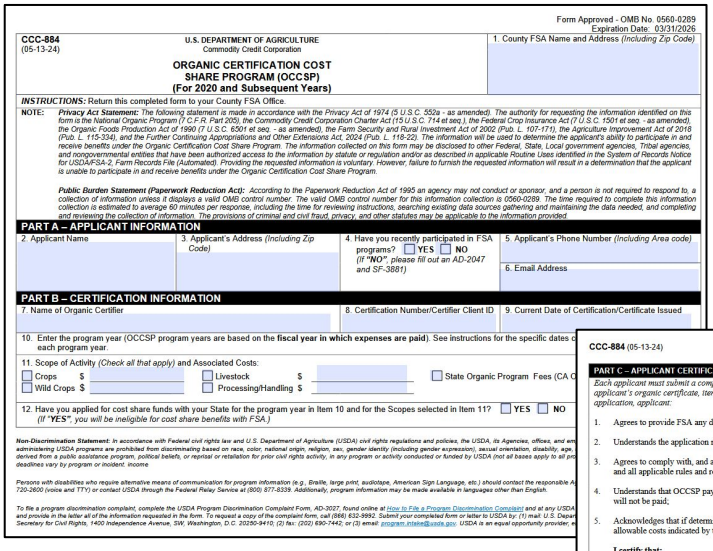
- Provide a tour of your farm, in which you show that your field history and maps in the OSP match your current plantings, demonstrate your storage of allowable pesticides, your livestock housing and pasture access, and so forth
- Review your OSP and any changes or updates in the case of a renewal inspection
- Show the inspector your records tracking seed and input purchases, harvests, and sales. Be prepared to show receipts.
- Walk the inspector through crop production from "seed to sale" in which you describe how a recently harvested crop moved from seed to field to harvest, with dates, locations and records
- In the case of a "split operation" in which some products are organic and some conventional, they will review and verify your processes to keep organic and non-organic inputs and products separate
- Inspectors will also tour the farm, verify storage and equipment areas, and look for consistency between what's on paper and what's happening in the field.
- A well-organized recordkeeping system and honest communication make the inspection smooth. Remember: they're not looking for perfection, they're looking for integrity and continuous improvement.

Renew Annually

You must renew your certification each year; this means updating your records, having an annual inspection, and paying your inspection fees.

Cost Share Funds lower costs to certify

While there are costs involved, programs like the Organic Certification Cost Share Program (OCCSP) can reimburse 75% of certification fees, up to $750. It is typically only a 2-page form, but it takes time and organization to send proof of payment and certification. OCCSP opens doors to new markets, higher premiums, and a trusted reputation for integrity and sustainability. Once you have completed the initial OSP, annual renewal and record maintenance is easier.



Form Approved - OMB No. 0560-0289
Expiration Date: 03/31/2026

CCC-884 (05-13-24)

U.S. DEPARTMENT OF AGRICULTURE
Commodity Credit Corporation

ORGANIC CERTIFICATION COST SHARE PROGRAM (OCCSP)
(For 2020 and Subsequent Years)

1. County FSA Name and Address *(Including Zip Code)*

INSTRUCTIONS: Return this completed form to your County FSA Office.

NOTE: ***Privacy Act Statement:*** *The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a - as amended). The authority for requesting the information identified on this form is the National Organic Program (7 C.F.R. Part 205), the Commodity Credit Corporation Charter Act (15 U.S.C. 714 et seq.), the Federal Crop Insurance Act (7 U.S.C. 1501 et seq. - as amended), the Organic Foods Production Act of 1990 (7 U.S.C. 6501 et seq. - as amended), the Farm Security and Rural Investment Act of 2002 (Pub. L. 107-171), the Agriculture Improvement Act of 2018 (Pub. L. 115-334), and the Further Continuing Appropriations and Other Extensions Act, 2024 (Pub. L. 118-22). The information will be used to determine the applicant's ability to participate in and receive benefits under the Organic Certification Cost Share Program. The information collected on this form may be disclosed to other Federal, State, Local government agencies, Tribal agencies, and nongovernmental entities that have been authorized access to the information by statute or regulation and/or as described in applicable Routine Uses identified in the System of Records Notice for USDA/FSA-2, Farm Records File (Automated). Providing the requested information is voluntary. However, failure to furnish the requested information will result in a determination that the applicant is unable to participate in and receive benefits under the Organic Certification Cost Share Program.*

Public Burden Statement (Paperwork Reduction Act): *According to the Paperwork Reduction Act of 1995 an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0560-0289. The time required to complete this information collection is estimated to average 60 minutes per response, including the time for reviewing instructions, searching existing data sources gathering and maintaining the data needed, and completing and reviewing the collection of information. The provisions of criminal and civil fraud, privacy, and other statutes may be applicable to the information provided.*

PART A – APPLICANT INFORMATION

2. Applicant Name
3. Applicant's Address *(Including Zip Code)*
4. Have you recently participated in FSA programs? ☐ YES ☐ NO *(If "NO", please fill out an AD-2047 and SF-3881)*
5. Applicant's Phone Number *(Including Area code)*
6. Email Address

PART B – CERTIFICATION INFORMATION

7. Name of Organic Certifier
8. Certification Number/Certifier Client ID
9. Current Date of Certification/Certificate Issued

10. Enter the program year (OCCSP program years are based on the **fiscal year in which expenses are paid**). See instructions for the specific dates c... each program year.

11. Scope of Activity *(Check all that apply)* and Associated Costs:
☐ Crops $ ☐ Livestock $ ☐ State Organic Program Fees (CA O...
☐ Wild Crops $ ☐ Processing/Handling $

12. Have you applied for cost share funds with your State for the program year in Item 10 and for the Scopes selected in Item 11? ☐ YES ☐ NO
(If "YES", you will be ineligible for cost share benefits with FSA.)

Non-Discrimination Statement: *In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and em... administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age... derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all pro... deadlines vary by program or incident, income.*

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible A... 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint and at any USDA ... and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Depart... Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov. USDA is an equal opportunity provider, e...

CCC-884 (05-13-24) Page **2** of **2**

PART C – APPLICANT CERTIFICATION STATEMENT

Each applicant must submit a complete application to an FSA county office to be eligible to receive program benefits. A complete application includes form CCC–884, a copy of the applicant's organic certificate, itemized documentation of certification expenses paid by the applicant, and forms AD-2047 and SF-3881 if not previously filed with FSA. By signing this application, applicant:

1. Agrees to provide FSA any documentation required to determine eligibility and to verify and support all information provided, including applicant's organic certificate;
2. Understands the application may be disapproved if the applicant fails to provide a complete application or any information requested by FSA;
3. Agrees to comply with, and acknowledges the applicant is subject to, all provisions of OCCSP as published in the Notice of Funds Availability published in the Federal Register, and all applicable rules and regulations;
4. Understands that OCCSP payments are provided on a first come, first served basis until all available funds are obligated, and applications received after all funds are obligated will not be paid;
5. Acknowledges that if determined eligible and funding is available, the applicant's certification cost may be adjusted from the amount entered in Item 11 to reflect eligible allowable costs indicated by the documentation submitted to support the application.

I certify that:

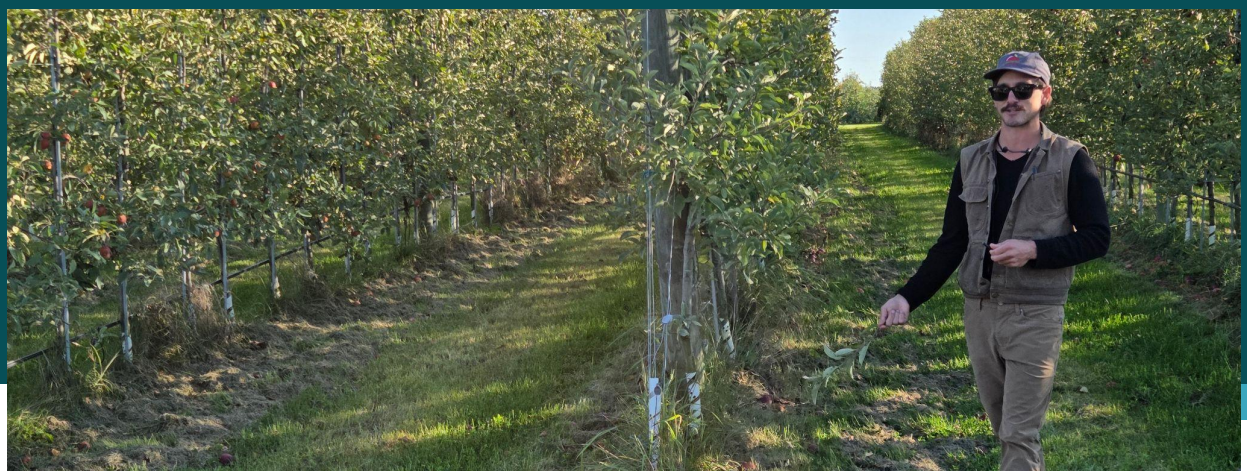
1. The above information provided by me or my legal representative is true and correct.
2. I understand that failure to provide true and correct information may result in the invalidation of this application, a determination of noncompliance or ineligibility, or other remedies or sanctions.
3. I understand that I may not receive duplicate benefits for the same scope of activity and program year from both a State Agency and FSA. If it is determined that I have received duplicate benefits, I have no right to retain those payments.

13. Applicant's Signature *(By)*
14. Title/Relationship of the Individual Signing in the Representative Capacity
15. Date *(MM/DD/YYYY)*

PART D – CCC REPRESENTATIVE APPROVAL OR DISAPPROVAL

16A. CCC Representative's Signature *(or Designee)*
16B. Title of Representative or Designee
17. Action: ☐ APPROVED ☐ DISAPPROVED
18. Date *(MM/DD/YYYY)*

The USDA Organic Certification Cost Share Program paperwork should not be a barrier for most organic farmers. It requires only the simple 2-page form shown here and sending in your organic certificate and proof of payment.



Kyle Rasch of Third Leaf Farm near Greenville transitioned the family apple orchard to organic over several years, by transitioning a few blocks each year

SECTION 1

Organic Crops

Primary Considerations

Success in organic crop production depends on designing a resilient, ecologically balanced system that meets certification standards and keeps plants thriving naturally. Planning and observation is as important as planting and harvest. Here are the core considerations:

Soil health and fertility

Build fertility through compost, green manures, and cover crops rather than synthetic fertilizers. Maintain soil structure by avoiding over tilling, preventing erosion, and feeding the microbial life that drives nutrient cycling. Avoid using synthetic fertilizers or amendments.

Crop rotation and diversity

Plan rotations that prevent pest and disease buildup, balance nutrient demand, and improve soil health. Mixing annuals, perennials, and cover crops adds resilience to the system. Avoid monocultures or planting the same annual crop year after year.

Weed, pest, and disease prevention and management

Focus on prevention through cultural and mechanical strategies like strategic cultivation, mulching, building habitat for beneficial insects, and maintaining healthy, stress-free plants. Chemical interventions are only allowed if they're on the National List of approved substances and may need to be justified to your certifier.

Seed, plant, and input selection

Use organic seed whenever available, and document any exceptions when organic seeds are not commercially available. Purchased starts must also be certified organic, or produced organically when commercial alternatives are not available. All inputs (fertilizers, soil amendments, pest controls) must be approved for organic production.

Water management

Use irrigation responsibly to prevent runoff and contamination. Efficient water use and protection of nearby waterways are integral to organic integrity.

Recordkeeping and traceability

Maintain detailed records of all inputs, field activities, harvests, and sales. Inspectors rely on this documentation to verify compliance and organic integrity. Your certifier will have forms or you can use the **USDA Documentation Forms for Organic Crop Producers**. You can also create your own system or use an app such as Tend, **CogPro** or **FarmBrite**.

Buffer zones and contamination prevention

Establish buffers between organic and non-organic fields to prevent drift or contamination from neighboring farms or conventional practices. You may want to list your land as organic through **DriftWatch**.

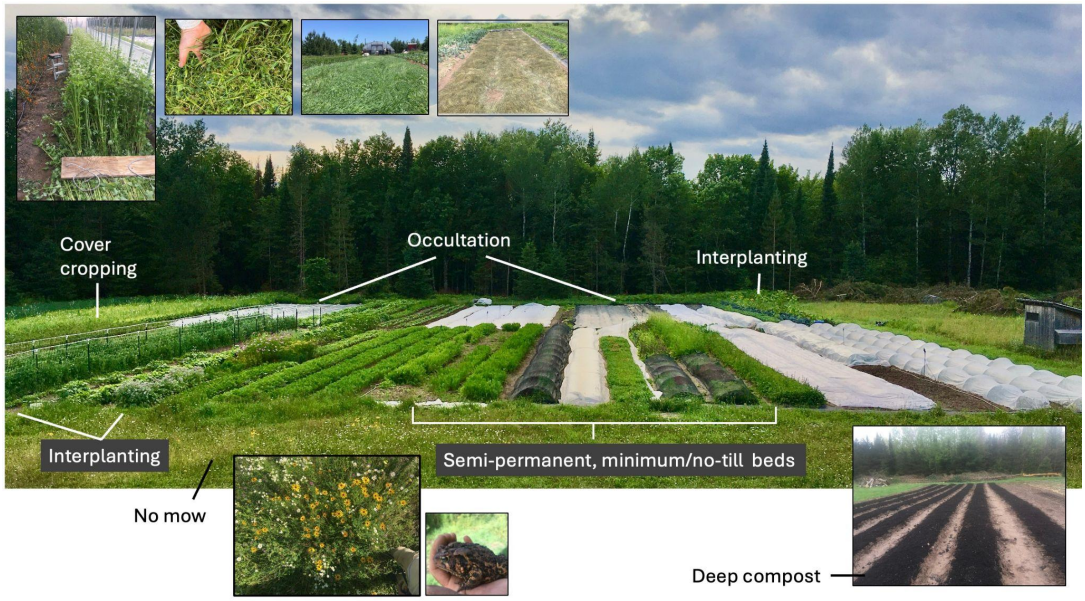
Getting Started with Organic Crop Production

1. Review the organic rules for crops

Begin by reviewing the **rules for organic crop production** or this detailed **Guide for Organic Crop Producers**. If you have any questions, reach out to your certifier.

2. Develop a land history

Begin by reviewing the land's management history. Organic certification requires that no prohibited substances have been used for the past three years. Gather any past records of fertilizer or pesticide use, and identify field boundaries and buffer areas. If you have managed the land for less than three years, contact prior managers to inquire about use of synthetic inputs. To certify without the 3-year transition, you or a previous landowner can fill out a Land Use History Verification (**page 2 of this document)** to show that the land has not had applications of prohibited substances.



Laura Brosius of Full Plate Farm in Michigan's Upper Peninsula created this infographic to show how she manages her soil organically.

3. Test and build soil

Conduct soil tests to assess nutrient levels, pH, and organic matter. Develop a fertility plan centered on compost, cover crops, and crop rotation.

4. Develop a crop rotation plan

Choose crops suited to your soil and climate, and design a **crop rotation** that prevents pest buildup and maintains fertility. Cover crops, green manures, and nitrogen-fixing legumes build soil health.

5. Source organic seed and plants

Purchase certified organic seed whenever available, and document any exceptions due to lack of commercial availability by checking 3 sources and keeping records of your seed search. Source certified organic plant materials, like transplants or bare-root trees whenever possible. If not possible, harvests from those plants will not be organic until they've been grown organically for 3 years.

6. Source organic inputs

Confirm that all soil amendments, fertilizers, and pest controls are approved for organic use. You can check the Organic Materials Review Institute for their **OMRI list,** use the **OMRI search** or use your certifier's database. Watch for the OMRI seal - it lets you know that a product is allowed by all certification agencies. Without the OMRI seal, you need to contact your certifier before using a product the first time. If it is a commonly-used product, such as Morgan's 101 potting soil, they will already know it is allowed. If it is less common, they typically will need 2 or 3 days to contact the supplier or they will ask you to get a letter stating that the product has no prohibited substances.

7. Build a recordkeeping system

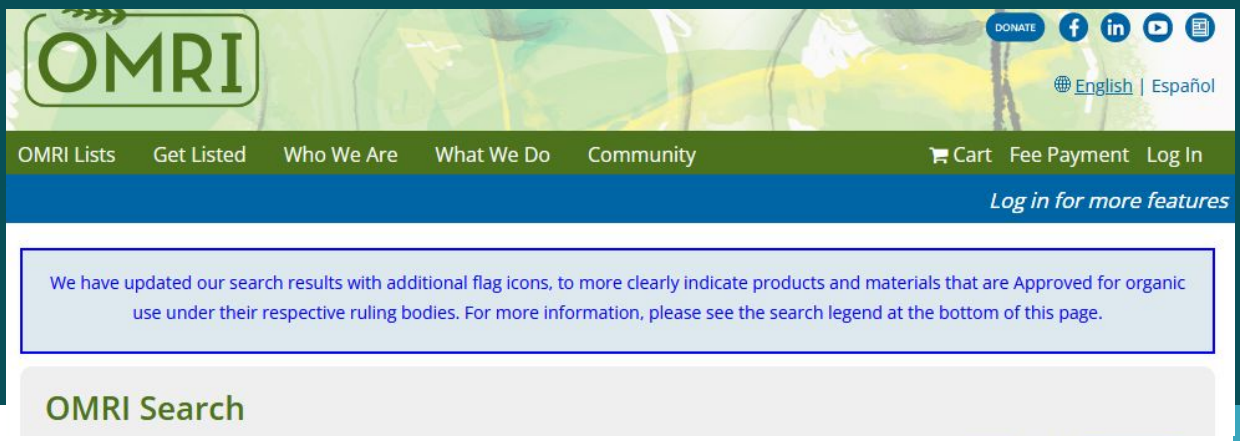
Create an organized way to track seeds and plants, inputs, field activities from planting to harvest, yields, and sales. You can keep your records with pen and paper, spreadsheets, or farm management software – choose whatever method works best for you to keep clear, consistent records that demonstrate your compliance with organic rules and help you make better management decisions. Your certifier will have forms or you can use the **USDA Documentation Forms for Organic Crop Producers.** You can also create your own system or use an app such as **CogPro** or **FarmBrite**.

8. Create an Organic System Plan (OSP)

The OSP is your organic farm's guiding document, showing how you manage soil fertility, weeds, pests, and recordkeeping. This plan is required for certification and updated annually.

9. Prepare for inspection and certification

Once your land meets the three-year transition requirement and your OSP is complete, contact an accredited certifier to start the inspection process. Maintain detailed records for all field activities, inputs, and harvests. You may want to prepare using these resources from **ATTRA**, **NOFA-Vermont** or by asking your certifier about what to expect.

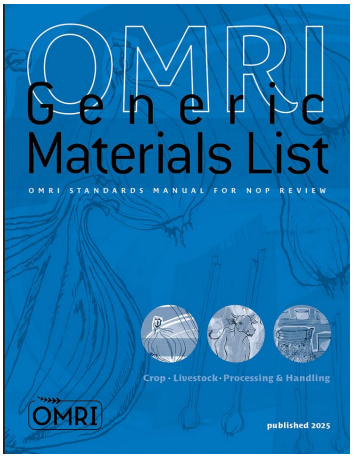


The Organic Material Review Institute (OMRI) decides whether products can be listed as organic. They post the results to search online and in 2 books.

SECTION 1

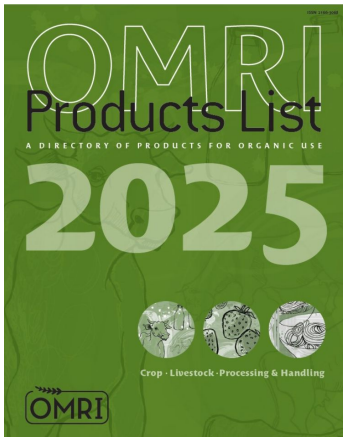
COMMON QUESTIONS

01 Does organic farming mean just substituting conventional fertilizers and pesticides with organic options?



No: organic inputs can be more expensive and less effective than their synthetic counterparts. To farm organically, you need to take a systems approach and focus on preventing problems before they start.

02 How do I know if an input or pest control product is allowed?



Inputs listed by the **Organic Materials Review Institute (OMRI)** or on your certifier's approved materials list are generally compliant. Many materials and products not listed by OMRI can be used in organic farming, but you should contact your certifier first to make sure its use is OK.

03 How do I manage weeds, pests, and diseases without herbicides?

Organic farmers rely on strategies like cover cropping, timely cultivation, mulching, and crop rotation to outcompete weeds and reduce the need for mechanical tillage over time. Similarly, pest scouting, crop rotation, using resistant varieties, proper spacing, and timing plantings help prevent pests and diseases before they become problems.

04 Can I grow organically if my neighbors spray chemicals now?

Yes, but you'll need buffer zones or physical barriers like tree windbreaks to prevent drift or contamination, and you must document how you protect your crops. You may also want to list your land on **DriftWatch**.

05 What crops are easiest to grow organically in Michigan?

For new growers, it is smart to learn organic growing practices for specific crops by working at organic farms growing that crop or by planting a small amount to learn to manage the crop organically. If you can't do that, visit a farm with that crop or find a mentor to guide you in growing it. For existing farms, you may want to start by transitioning a small part of your current farm to growing organically to try out the growing practices and watch for success.



Agape Organic Farms is one of just a few farms in Michigan with certified organic livestock. They also raise certified organic mushrooms.

SECTION 2

Organic Livestock

Primary Considerations

Managing animals organically requires attention to their welfare, diet, and living conditions, as well as detailed recordkeeping to demonstrate compliance. Key considerations include:

Animal health and welfare

Animals must have access to the outdoors, fresh air, and room to move freely. Producers must focus on balanced nutrition, clean housing, and low-stress handling as a facet of preventative health care.

Feed and nutrition

Livestock must be fed 100% organic feed, including access to certified organic pasture for ruminants like cattle, sheep, and goats. Synthetic growth hormones, animal by-products, and non-organic supplements are prohibited.

Pasture and grazing management

Ruminants must graze on certified organic pasture for a minimum of 120 days a year and derive at least 30% of their dry matter intake from pasture during the grazing seasons. Pasture plans should outline rotational grazing schedules, rest periods, and erosion prevention.

Housing and living conditions

Housing must allow natural behaviors, adequate ventilation, and access to outdoor space. Bedding must be organic if it comes from a feed crop, like straw or hay.

Preventative health care

Vaccinations are allowed, but antibiotics and most synthetic medications are not. If an animal becomes ill, it must receive appropriate treatment, even if it means losing organic status.

Recordkeeping

Keep thorough records of feed sources, veterinary care, and pasture management. Inspectors will review these to confirm compliance with organic standards. Livestock must be individually identifiable through permanent, tamper-proof methods like ear tags, tattoos, or other approved methods.

Getting Started with Organic Livestock Production



Although these cattle are raised on organic pasture, a shortage of certified organic butcher facilities is a barrier for some in Michigan. Be sure to find a processor who meets your needs.

Transitioning to organic livestock production means aligning animal care, feed, and pasture management with USDA organic standards while creating systems that support natural health and welfare. Here's how to get started:

1. Review the organic rules for livestock

Read through the **rules for organic livestock production** or dive in deep with the **Final Rule adopted in 2024** or the **Guide for Organic Livestock Producers**.

2. Transition your land and animals

Pastures and forage must be managed organically for at least 36 months before livestock products can be sold as organic. Animals themselves also have transition rules: ruminants for dairy production must be managed organically for at least 12 months prior to milk production; livestock for meat production must be managed organically from the last trimester in utero; and poultry must be organic from the second day of life.

3. Develop a pasture and feed plan

Create a grazing plan that meets the requirement for ruminants to obtain at least 30% of their dry matter intake from pasture during the grazing season. Source 100% organic feed, including minerals and supplements approved by your certifier. The **Purdue Forage Field Guide**, or MSU Grazing school can help you make a plan. NRCS EQIP can create a Grazing Management Plan and pay cost share for some of the **conservation practices common for grazers**.

4. Establish housing and welfare practices

Ensure animals have access to the outdoors year-round, with shade, shelter, clean water, and space to move naturally. Housing should be clean, dry, and designed to minimize stress and disease. A great guide for designing livestock shelter is *Polyface Designs*.

5. Create a preventative health program

Emphasize animal welfare through balanced nutrition, biosecurity, and proactive management. Vaccinations and certain natural treatments are allowed, but antibiotics and most synthetic drugs are not allowed.

6. Keep detailed records

Track feed purchases, veterinary care, pasture rotations, and animal movement. These records form the foundation of your **Organic System Plan (OSP)** and are essential for inspection and certification.

7. Work with a certifier

Identify a potential certifier early in the process so you can reach out to them for support and advice before submitting your application. Submit your OSP outlining livestock care, feed sources, and pasture management following the templates they provide. Once reviewed, your farm will undergo inspection before certification approval.



Organic livestock can spend time in shelters, but they must have access to outdoor pasture that is certified organic. There are exceptions for extreme weather and for life stages that need protection, such as chicks and newly born animals.

SECTION 2

COMMON QUESTIONS

01 Can I transition my existing herd to organic?

Yes. Dairy animals must be managed organically for at least 12 months before their milk can be sold as organic, while livestock for meat must be raised organically from the last third of gestation. Poultry, including egg layers, must be managed organically starting no later than the second day of life.

02 Can my livestock be organic if they have no outside access, or if the outside areas are conventional?

No – new livestock rules mean that all animals must have meaningful access to outdoor areas, and those outdoor areas must be managed organically. Livestock farmers who certify organic usually must maintain a certification for their livestock, plus an organic crop certification for their pastures and land.

03 How much does organic feed for animals cost?

Organic feed usually costs 2-3 times the amount of conventionally grown feed, and is one of the largest costs involved in raising livestock organically. Many local feed stores stock organic feed. If you are looking to produce organic livestock for commercial purposes, you will probably need to purchase organic feed in bulk. Michigan suppliers include:

- **Graham's Organics** in Rosebush
- **Raub Rae Farms** in Brown City
- **Dexter Mill** in Dexter
- **Hall's Feed Mill** in Traverse City
- **Kalmback Feeds** in Breckenridge.

Many local feed stores are able to sell organic feed by the pallet for a discounted price.

04 How can I manage parasites and diseases without antibiotics and synthetic antiparasitics?

Preventing problems is the first line of defense – this means providing good nutrition, low stress environments, monitoring health closely, and choosing breeds with good disease resistance. Use rotational grazing, multi-species grazing, and strategic pasture management to break parasite life cycles. The tipsheet on **Treatment of Sick or Injured Organic Livestock** can help you find the right strategies, but you may sometimes need a veterinarian - preferably one familiar with organic options.

05 Can I raise organic and non-organic animals on the same farm?



Yes, but you must maintain complete separation between the two systems: different feed, housing, equipment, and recordkeeping. Inspectors will check that there's no commingling or contamination between organic and conventional animals.



SECTION 3

Organic System Plans

This section includes some templates to help you write your organic system plan. We have included following resources from the USDA:

Organic System Plans

- OSP Template – Organic Production (docx) – *included in full*
- OSP Template – Crop Production (docx) – *first page is included*
- OSP Template – Livestock Production (docx) – *first page is included*

Certifiers often have their own forms. You can find the Organic System Plan templates for several certifiers popular in Michigan by looking here:

- Organic System Plan templates for OCIA, OEFFA, Oregon Tilth and SCS

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

Organic System Plan Template – Organic Production

Forms Checklist	**7 C.F.R. §§ 205.2 - 205.406**

Please note that these forms are suggested templates; contact your certifier for approval of the forms you plan to use. Please provide thorough descriptions that reflect all your current and planned practices. The U.S. Department of Agriculture (USDA) organic regulations require Organic System Plans (OSPs) to be reviewed and updated annually. Whenever you anticipate a change in your operation's practices, procedures or materials, please update and resubmit the sections or pages that reflect that change. This Forms Checklist must be submitted along with your application, OSP, and all other forms indicated below.

DESCRIPTION OF ORGANIC PRODUCTION

Please provide a brief, general description of your organic operation, including: crops or crop types and cropping systems; livestock raised and animal products; any handling activities related to your crop and livestock production; and type(s) of marketing and sales (contract, wholesale, direct marketing, etc.).

_____
_____
_____
_____

All applicants seeking organic certification, whether for crop and/or livestock production and/or handling, please complete these forms:

- ☐ Forms Checklist (this form)
- ☐ Affidavit
- ☐ Land Requirements Form +
- ☐ Documentation of Prior Land Use
- ☐ Application
- ☐ Natural Resource Management
- ☐ Map +

Submit a Land Requirements Form with a Map and Documentation of prior land use for each farm, ranch or production location. Total number of locations/sets of forms: _____

- ☐ Fees (no template)
- ☐ Sales Report (no template)

Complete the OSP forms (sections) that best describe your organic operation. The Crop and Livestock Production Overviews, respectively, will guide your selection of forms. Check the box by each OSP form that you are submitting with your application for certification.

Crops (as applicable):
- ☐ Crop Production Overview
- ☐ Seed and Planting Stock
- ☐ Soil Management and Crop Rotation

Livestock (as applicable):
All Livestock Producers:
- ☐ Livestock Production Overview
- ☐ Origin of Livestock

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

- ☐ Pest, Disease, and Weed Management
- ☐ Prevention of Commingling and Contamination
- ☐ Materials List
- ☐ Recordkeeping, Labeling, and Audit Trail
- ☐ Greenhouse Crop/Seedling Production
- ☐ Compost and Manure Use/Production
- ☐ Crop Post-Harvest Handling
- ☐ Wild Crop Harvest
- ☐ Livestock Living Conditions
- ☐ Livestock Health Care
- ☐ Livestock Feed
- ☐ Livestock Recordkeeping
- ☐ On-Farm Handling of Livestock Production

Ruminant Livestock Producers:

- ☐ Ruminant Livestock and Pasture (Pasture Management, Ruminant Feed and Dry Matter Intake)

Supplementary Documentation: Your certifier may request additional information or specific documentation forms. You may attach other documentation relevant to your OSP. Please indicate or list all supplementary documents that are attached.

- ☐ Documentation of Prior Land Management
- ☐ Field History Forms/Input Material Records
- ☐ Organic Seed Non-Availability/Non-GMO Documentation
- ☐ Worksheets/Calculation of Dry Matter Intake (Ruminant Livestock)
- ☐ Other (list all other items submitted as attachments to your Application/OSP):

Application **7 C.F.R. § 205.401**

OSP Template – Organic Production (Rev. 2015) Page 2 of 8

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

a) Applicant(s)		
b) Farm, ranch, or business name		
c) Mailing address		
d) Physical address		
e) City	f) State	g) Zip code
h) Primary phone no.	i) Alt. phone no.	j) Fax no. (optional)
k) Email address		
l) County(ies) where farm/ranch is located		

m) Organizational Structure/Legal Status:

- ☐ Sole Proprietorship
- ☐ S corporation
- ☐ Trust
- ☐ Government/Public Agency
- ☐ Legal Partnership
- ☐ Limited Liability Corporation
- ☐ Non-Profit Organization
- ☐ Other (specify):

n) If a corporation, list the State of incorporation and name, if different than listed above:

o) Name of the person(s) authorized to act on the applicant's behalf

p) Address	q) Telephone number

r) List the name(s) of any certifier(s) to which an application has been previously made, and date(s) of application: ☐ none

s) Outcome of the application submission(s)

t) If you have received any notification of noncompliance or denial of certification, please attach these with a description of actions taken to correct noncompliances, including evidence of correction. ☐ Attached ☐ Not applicable

u) This application must be accompanied by a completed OSP form that includes all organic production and handling activities for which you are seeking certification. ☐ attached

☐ *The signature below is from an authorized representative of the operation applying for certification.*

Signature of Applicant(s) _____ **Date** _____

SEND APPLICATION, OSP AND FEES TO: Certifier Name, Address, and Telephone Number

Note: All business information submitted or collected is confidential and exempt from public inspection and copying.

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

Affirmations **7 C.F.R. §§ 205.400, 205.401**

- ☐ I/We agree to comply with all applicable organic production and handling regulations as described in the final rule issued by the USDA Agricultural Marketing Service and codified in 7 C.F.R. Part 205.
- ☐ I/We agree to establish, implement, and update annually an OSP. I/We affirm that the attached OSP includes and accurately describes all aspects of my/our current organic operation.
- ☐ I/We will immediately notify our certifier of any change in my/our certified operation or portion of it that may affect its compliance with the Organic Foods Production Act of 1990 or the USDA organic regulations. I/We will submit an OSP update whenever changes are made, thus ensuring that the application/OSP consistently reflects my/our current organic operation.
- ☐ I/We have made/kept a copy of my/our application, OSP, and all applicable attachments and addenda.
- ☐ I/We understand that a certifier's acceptance of this form in no way implies granting of certification.
- ☐ I/We have reviewed the USDA organic regulations. I have asked the certifier for clarification of any points that were unclear to me so that I now understand them.
- ☐ I/We agree to comply with all applicable State and NOP production and handling standards as described in the final rule of the USDA Agricultural Marketing Service and codified in the USDA organic regulations at 7 C.F.R. Part 205.
- ☐ I/We will permit onsite inspections with complete access to the production or handling operation, including noncertified production and handling areas, structures and offices, by the certifier. I understand that my operation may be subject to announced and/or unannounced inspections and/or sampling for residues at any time as deemed appropriate to ensure compliance with the USDA organic regulations.
- ☐ I/We agree to maintain all records applicable to the organic operation for not less than five (5) years beyond their creation and to allow authorized representatives of the Secretary of the USDA, the applicable State organic program's governing State official, and the certifier access to such records during normal business hours for review and copying to determine compliance.
- ☐ I/We agree to immediately notify my/our certifier concerning any application, including drift, of a prohibited substance to any field, production unit, site, facility, livestock, or product that is part of an operation.
- ☐ I agree to submit applicable fees charged according to the fee schedule by the certifier.
- ☐ I/We affirm that all information in this application/OSP is true and accurate to the best of my/our knowledge.

Signature of Applicant/Authorized Representative Date

Submit completed forms, fees and supporting documents to your certifier.

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

Land Requirements **7 C.F.R. §§ 205.103, 205.202**

This form describes a farm or production location for organic crop and/or livestock production and allows accompanying documentation to establish its eligibility for organic certification. Submit one copy of this Land Requirements form for **each** farm location (not for individual fields) that is non-adjacent to your other farmland or production locations, and/or has distinct land use history (different date of last prohibited materials use or different prior land manager, etc.).

☐ This Land Requirements form describes all the land in my organic operation.
☐ Additional copies of this form are attached and describe other land within my operation.

2.1 LAND DESCRIPTION		
Farm Name or Number	Area (acres) to be certified organic	
Parcel Location	Field Numbers (for *all* fields)	
City/Town	State	County
Legal Description: Section/Township/Range or Assessor's Parcel Number		

2.2 LAND MANAGEMENT **7 C.F.R. § 205.202(a) and (b)**

a) When did you being managing this land? (mm/dd/yy) _____
b) What was the date of last use of prohibited materials? _____
☐ Not applicable; no prohibited materials applied.
c) What is your estimated harvest date of a certified organic crop from this land? _____
d) Describe, in general terms, how this land has been managed for the past three years: crops grown; fallow; pasture, etc.; organic or non-organic management; farming practices used.

_____

2.3 LAND USE HISTORY DOCUMENTATION **7 C.F.R. § 205.202**

a) Check the type(s) of documentation attached that shows eligibility of this land for organic certification:

☐ current organic certificate in my operation's name; continuing certification
☐ prior land manager affidavit ☐ field history form
☐ copy of the organic certificate from a previous manager ***and*** associated documentation (profile with parcel address or location, maps) to show that this land has been continuously certified with no lapse in organic management up to the date of transfer of management
☐ other documentation that shows all materials used on this land and the date(s) they were used in the last three years (describe):

_____

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

2.4 MAPS **7 C.F.R. § 205.202(c)**

a) Attach Field Map(s). Provide an accurate map that shows each field included on the farm listed above. Show boundaries and area to be certified. The map should be 8 ½ x 11". This may be a county parcel map, Farm Service Agency map, aerial photograph, or a detailed hand-drawn map, as long as it is clearly readable when photocopied. This map must be current and dated. An updated (revised or new) map must be submitted whenever information on the map changes (field numbers, acres, buffers, adjoining land use, etc.)

The map attached includes the following:

- ☐ field name(s)/number(s)
- ☐ north arrow
- ☐ adjoining land use(s)
- ☐ landmarks such as buildings, farm or public roads, railroad tracks
- ☐ area (acres)
- ☐ slope(s)
- ☐ buffers (if applicable)
- ☐ windbreaks, hedgerows or woodlands

Required for ruminant livestock producers:

- ☐ location, size and identification of pastures
- ☐ location and types of permanent fences
- ☐ feeding area(s) (to feed without crowding)
- ☐ location and source of water and shade

b) Attach a Farm Overview Map that shows the location of this farm and all other farm locations in your operation.

☐ Attached ☐ Not applicable; one farm location only

2.5 BOUNDARIES, ADJACENT LAND USE AND BUFFER AREAS **7 C.F.R. § 205.202(c)**

a) Describe your farm borders and adjacent land use (organic farms, fallow fields, CRP land, wild lands, non-organic crop or livestock production, residential use, etc.)

_____

b) Describe the measures you take (management practices, communications and/or physical barriers) to prevent contamination by prohibited materials that are or may be applied to adjacent or nearby land (neighboring parcels or fields in split operations). ☐ No areas of concern.

_____

c) Describe buffer areas for each field/pasture that you maintain on your organic land to protect crops from contamination. Please specify whether you grow crops in the buffer area, and whether you plan to sell or represent them as organic. If you need more space, please attach a separate page. ☐ Buffer description attached.

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

Natural Resource Management **7 C.F.R. §§ 205.2, 205.200, 205.203, 205.239, 205.240**

Key regulations related to natural resource management:

§ 205.2 Definitions:

Organic production. A production system that is managed in accordance with the Act and regulations in this part to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity.

Natural resources of the operation. The physical, hydrological, and biological features of a production operation, including soil, water, wetlands, woodlands, and wildlife.

§ 205.200: Production practices implemented in accordance with this subpart must maintain or improve the natural resources of the operation, including soil and water quality.

§ 205.203(a): The producer must select and implement tillage and cultivation practices that maintain or improve the physical, chemical, and biological condition of soil and minimize soil erosion.

§ 205.203(c): The producer must manage plant and animal materials to maintain or improve soil organic matter content in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances.

§ 205.239(e): The producer of an organic livestock operation must manage manure in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, heavy metals, or pathogenic organisms and optimizes recycling of nutrients and must manage pastures and other outdoor access areas in a manner that does not put soil or water quality at risk.

§ 205.240(c)(8): The pasture plan shall include a description of the erosion control and protection of natural wetlands and riparian areas practices.

Organic standards specifically address soil (conservation and health) and water (conservation and quality; contamination prevention). As quoted above, the standards also include a general requirement to maintain or improve natural resources (soil, water, wetlands, woodlands and wildlife) by integrating cultural, biological and mechanical practices to foster cycling of resources, promote ecological balance, and conserve biodiversity. Organic production practices must maintain or improve their natural resources.

While natural resource management is a core organic standard, producer strategies will be specific to each site and type of production. Each operation's practices are adapted to the features of the land and local conditions, especially related to: soil (soil types, slope, risks of erosion, and overall health); water (position in the watershed, presence of water courses and riparian areas, and water usage); and wetlands, woodlands and wildlife (ecosystem type, biological diversity and habitat on and around the farm).

Organic farming practices can conserve soil, increase soil health, protect water and contribute to biological diversity within—and often beyond—its boundaries. On-farm practices may include: soil building to increase organic matter, humus, biological activity and diversity of soil

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

organisms; inclusion of flowering plants, habitat or shelter for pollinators, insects, other arthropods, spiders, bats, raptors and other predators; control of specific non-native invasive species; establishment of grassed waterways or hedgerows to check erosion and foster habitat; watershed protection; habitat restoration; or efforts to promote wildlife migration corridors or conservation.

Update changes: Signature _____ Date _____

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

Organic System Plan Template – Crop Production

Crop Production Overview — **7 C.F.R. § 205.2-205.406**

1. List all crops (or types of crops if your operation is highly diversified) you grow or harvest for which you are seeking organic certification. Include food and feed crops, pasture/forage, and wild-crops.

   _____

   _____

2. Check the box that describes your operation's production systems:
   - ☐ all organic production
   - ☐ organic and non-organic production

3. Do you grow crops in soil?
   - ☐ No
   - ☐ Yes; please submit the following Crop OSP forms: Crop Rotation and Soil Management; Pest, Disease and Weed Management; Prevention of Contamination and Commingling; Recordkeeping, Labeling and Audit Trail. ☐ Attached (4 forms)

4. Do you plant seeds, seedlings, or planting stock of any kind?
   - ☐ No
   - ☐ Yes; please submit the Seeds and Planting Stock form. ☐ Attached

5. Do you use any off-farm input materials?
   - ☐ No
   - ☐ Yes; please submit the Materials List form. ☐ Attached

6. Do you produce seedlings or crops in containers with planting medium, or grow crops in a greenhouse, coldframe or hoophouse?
   - ☐ No
   - ☐ Yes; please submit the Greenhouse Crop form. ☐ Attached

7. Do you produce compost or use purchased compost?
   - ☐ No
   - ☐ Yes

8. Do you use manure?
   - ☐ No
   - ☐ Yes

Last Name(s)	First Name(s)	Farm/Ranch/Business Name	Date

Organic System Plan Template – Livestock Production

Livestock Production Overview — **7 C.F.R. §§ 205.105, 205.201, 205.301-311**

1. Please indicate or list all livestock and livestock products for which you are seeking certification.
   - ☐ Livestock for slaughter
   - ☐ Meat
   - ☐ Milk
   - ☐ Other (specify): _____
   - ☐ Replacement animals
   - ☐ Eggs
   - ☐ Other dairy products (list)
   - ☐ Breeding stock
   - ☐ Fiber

2. Check the box that describes your operation's livestock production systems:
   - ☐ all organic production
   - ☐ organic and non-organic production

3. Do you raise non-ruminant livestock, such as poultry or swine?
   - ☐ No
   - ☐ Yes; please submit the following Livestock OSP forms: Origin of Livestock, Livestock Living Conditions, Livestock Health Care, Livestock Feed, Livestock Recordkeeping, Labeling and Audit Trail. ☐ Attached (5 forms)

4. Do you raise ruminant livestock?
   - ☐ No
   - ☐ Yes; please submit all of the forms listed in question 3, plus the Ruminant Livestock and Pasture form, and the Crop Production Overview with appropriate forms. (All ruminant producers must manage pasture as a crop.) ☐ Attached

5. Do you raise crops?
   - ☐ No
   - ☐ Yes; please submit the Crop Production Overview, and additional forms, as appropriate. (All ruminant producers must manage pasture as a crop.) ☐ Attached

6. Describe all handling activities of livestock production for which you are requesting certification.
   - ☐ Not applicable; no handling. If you do simple handling activities of your own production (i.e., cool and store milk, wash and pack eggs, etc.), or prepare feed for your own livestock (i.e., silage production, grinding and/or mixing) these may be certified as part of your livestock operation. Please complete and attach an On-Farm Handling of Livestock Production OSP.
   - ☐ On-Farm Handling of Livestock Production form attached. If your handling operation includes complex processing (i.e., slaughter, cut and wrap, cook or smoke meat, cheesemaking, etc.) and/or includes handling crop or livestock products for other



RESOURCES & PARTNERS

National & Regional Programs and Resources

- USDA National Organic Program (NOP): https://www.ams.usda.gov/about-ams/programs-offices/national-organic-program
- USDA Farmers.gov resources for organic: https://www.farmers.gov/your-business/organic
- USDA Natural Resources Conservation Service (NRCS): https://www.nrcs.usda.gov/getting-assistance/other-topics/organic
- eOrganic Organic Agriculture Community of Practice of eXtension: https://eorganic.info/
- National TOPP farmer resources: https://www.organictransition.org/resources/
- USDA Organic Certification Cost Share Program: https://www.fsa.usda.gov/resources/programs/organic-certification-cost-share-program-occsp

- Organic Farmers Association: https://organicfarmersassociation.org/resources/
- Organic Farming Research Foundation: https://ofrf.org/
- Organic Trade Association: https://www.organic-center.org/
- Real Organic Project: https://realorganicproject.org/
- Marbleseed: https://marbleseed.org/
- Rodale Institute: https://rodaleinstitute.org/
- OEFFA: https://www.oeffa.org/
- NCAT/ATTRA Sustainable Agriculture program: https://attra.ncat.org/
- Sustainable Agriculture Research and Education: https://www.sare.org/
- Ag Solidarity Network: https://agsolidaritynetwork.com/
- Organic Seed Alliance: https://seedalliance.org/
- OGrain Resource List: https://ograin.cals.wisc.edu/resources/organic-grain-resource-list/
- Organic Materials Review Institute: https://www.omri.org/

Michigan Programs and Resources

- Michigan TOPP: https://www.canr.msu.edu/organictransition/index
- MSU OFTP: https://www.canr.msu.edu/organic_farmer_training_program/
- MOFFA: https://moffa.net/
- MIFFS: https://miffs.org/

- MSU Extension: https://www.canr.msu.edu/outreach/
- Michigan Driftwatch: https://mi.driftwatch.org/map
- OFTP Certification Options chart: https://docs.google.com/document/d/1Mk4lqe_Dt8dukc6tv4o--6vGWEBmCZkT/edit?usp=sharing&ouid=114599576093519613781&rtpof=true&sd=true
- OFTP Organic Amendments guide: https://docs.google.com/document/d/1DYCVI0hdqFqKk5UPLH6s0pFPPkdviyzx/
- OFTP Organic Records templates: https://drive.google.com/drive/folders/1w-LtapnRrGidME3xzM6SrENb-LJzctuD
- Map of resources for Michigan organic farmers: https://www.google.com/maps/d/u/1/viewer?ml_sub=260914820755227159 3&ml_sub_hash=d8z7&utm_source=newsletter&utm_medium=email&utm_campaign=november_conservation_update&utm_term=2024-11-10&mid=1nmbpEHEnGvvabSzr0WgcP3ROz64Nsgs&ll=40.16700275549982%2C-95.56447955000002&z=4
- Interactive map of Beginning farmer resources: https://www.canr.msu.edu/organic_farmer_training_program/resources/map.html
- Michigan Sustainable Farm Jobs and Opportunities Listserv: Email listserv@list.msu.edu with SUBSCRIBE MISUSTAINABLEFARMJOBS in the body of the message (NOT just the Subject line)

Where to start?

- Excellent collection of dozens of good resources for organic rules and recordkeeping: https://www.ams.usda.gov/services/organic-certification/organic-records
- https://carolinafarmstewards.org/resources/organic-certification-and-production-guide/
- Workbook with great info for transitioning to organic: https://www.sare.org/resources/organic-transition/
- **Choose an accredited certifying agency**
- **Organic System Plan templates** for OCIA, OEFFA, Oregon Tilth and SCS
- **USDA Documentation Forms for Organic Crop Producers**. You can also create your own system or use an app such as
- Apps for Organic Farm Recordkeeping:
  - **Tend**
  - **CogPro**
  - **FarmBrite**
- **DriftWatch**
- **Rules for organic crop production**
- **Guide for Organic Crop Producers**
- **Crop Rotation on Organic Farms** - free pdf of SARE book
- **Organic Materials Review Institute (OMRI)** list or the **OMRI search**
- **USDA Documentation Forms for Organic Crop Producers**
- **ATTRA** Preparing for an Organic Inspection
- **NOFA-Vermont** - Preparing for an Organic Inspection
- **Purdue Forage Field Guide**
- **Conservation practices common for grazers**
- **Treatment of Sick or Injured Organic Livestock**

Soil Test Labs:

- MSU Labs: permanently closed, but MSU will send out your test to A & L and then interpret the results for you
- Morgan Composting: free consultation with test - https://dairydoo.com/soil-testing-services/
- A & L Labs: https://algreatlakes.com/pages/services
- Cornell: lead tests; biology & C tests https://soilhealthlab.cals.cornell.edu/testing-services/
- Vriesland Growers' Cooperative: best for muck soils https://fcelevator.com/agronomy/
- Midwestern BioAg: https://www.midwesternbioag.com/our-approach/services/
    - NOTE: if you get a soil consultation from someone who sells products, they will want to sell you products (Morgan's high-grade compost; Midwest BioAg amendments, etc).

Lead Testing:

- Kido at Keep Growing Detroit for tests in Detroit, Highland Park and Hamtramck https://www.detroitagriculture.net/support
- Accurate Analytical Testing in Romulus Michigan
    - atheys@accurate-test.biz or customersupport@accurate-test.biz
    - https://accurate-test.com/LeadTesting
    - 734-699-5227, 734-629-8161

- Envirolab Services in Oscoda Michigan - $45 +$15 shipping for community gardens; $120 for other sites. https://envirolabservice.com/contact/
- Cornell: lead tests; biology & C tests https://soilhealthlab.cals.cornell.edu/testing-services/
- Penn State Ag Analytical Lab https://agsci.psu.edu/aasl/soil-testing/environmental
- UMass Soil & Plant Nutrient Testing Lab (*Choose Total lead analysis - not correlation lead analysis) https://ag.umass.edu/services/soil-plant-nutrient-testing-laboratory/lab-services

Accredited Certifiers Working with Small and Medium Sized Producers in Michigan

- CCOF: https://www.ccof.org
- Ecocert: https://usa.ecocert.com/
- GOA: https://www.goa-online.org/members/
- MOSA: https://mosaorganic.org/
- NICS: https://naturesinternational.com/nics/assessment
- OCIA: https://ocia.org/transitioning-to-organic/
- OEFFA: https://www.oeffa.org/
- OnMark: https://www.onmarkcertification.com/certification
- Oregon Tilth: https://tilth.org/certification/apply/
- Who certifies organic producers and processors in Michigan?: https://docs.google.com/document/d/1IDCNKrGpwTpp8Jem3KE8MMy_VW4imaIqFFzztDdX4Sc/edit?usp=drive_link
- Michigan Certifiers cost breakdown: https://drive.google.com/file/d/1W5OHLDybCGxcVd15oODRq5eKnCYfCAuH/view?usp=drive_link

PLANTS

Nutrient Management



AUTHORS & INSTITUTIONS

Lindsay Brown, Tree Fruit Research Technologist, Penn State University
Jeremy Jubenville, Floriculture and Greenhouse Educator, Michigan State University Extension
Jonathan LaPorte, Farm Business Management Educator, MSU Extension
Erin Lauwers, Integrated Pest Management Educator, MSU Extension
Emily Lavely, Tree Fruit Educator, MSU Extension
Derek Plotkowski, Fruit Educator, MSU Extension
Madelyn Celovsky, Conservation Agronomist Educator, MSU Extension
Cheyenne Sloan, Blueberry and Small Fruit Educator, MSU Extension
Benjamin Phillips, Vegetable Specialist, MSU Extension
Steve Whittington, Field Crops Educator, MSU Extension

SECTIONS

Section 1: SMART Nutrient Management

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

As a young or beginning farmer, you may be raising crops to reduce feed costs or to sell. One of the important decisions in crop production is managing the nutrient needs of the crop you'll grow. If you apply too many nutrients, potential profits are reduced; supply too few and plant growth may be limited. Correctly managing nutrients can help you optimize crop production and achieve your farm goals.

How To Get Started

Many factors go into nutrient management. Understanding the soil is the first consideration since the properties and characteristics of the soil can greatly affect how pre-existing and added nutrients are available for the plant to use. Soil test results can tell you what nutrients are already present and if they are available to the intended crop. This is crucial information as you start to think about the amount, types and forms of nutrients needed overall.

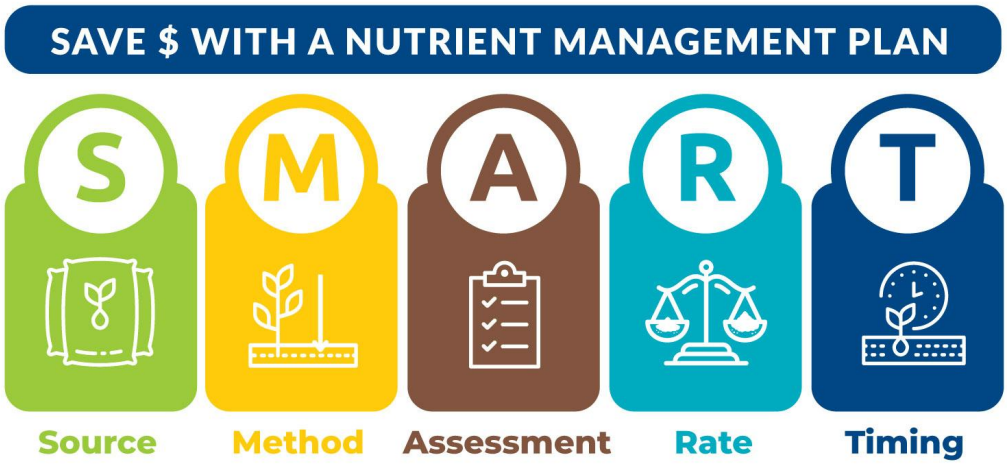
A nutrient management plan is influenced by what the yield goals are and whether the soil needs to be built up. You'll also need to learn about the available forms of fertilizer. Using the information collected from both the soil and the available fertilizer options, you'll begin to create a nutrient management plan for the farm. Deciding how and when to apply the fertilizer completes the decision factors needed for a successful and profitable crop. Every few years, evaluate your nutrient management plan with repeated soil tests and recalibrate your plan to maintain optimal plant and soil health.



SECTION 1

SMART Nutrient Management

The **USDA-NRCS** has a SMART nutrient management plan framework. It is focused on the **s**ource, **m**ethod, **a**ssessment, **r**ate, and **t**iming of nutrient applications.



(https://www.nrcs.usda.gov/getting-assistance/other-topics/nutrient-management)

Primary Considerations



SOURCE

Whether you use commercially produced fertilizer, manure, or compost, ensure that the fertilizer content matches your soil needs. Soil testing and plant tissue tests can inform your source selection. Keep in mind that your nutrient management program can only be as successful as the most limiting nutrient.

- Not all compost is created equal! Composting can lead to issues with pest, disease, and weed pressure. Learn how to compost effectively before getting started. **CORNELL Composting**



METHOD

There are many **methods of fertilizer applications.** Consider how you will introduce the amendment into the environment. If you are planting perennial crops, it is significantly easier to make larger soil adjustments on bare ground before planting than it is after the plants are established. Application methods can include injection, broadcasting, incorporating with tillage, fertigation and foliar applications.

ASSESSMENT

Successful nutrient management requires an understanding of the baseline soil conditions. Assess the baseline land conditions, such as water drainage, and submit a comprehensive soil test. This will help make land use decisions and should inform your soil nutrient amendments.

- Testing soil for contaminants can alert you to heavy metal or PFAS contamination in your soil before you get started.
- Soil components can inform your most successful use of the land. For example, pH can be difficult to make large adjustments to and different crops have different pH requirements to efficiently uptake nutrients.

RATE

Consider your baseline nutrient availability, how your farming practices are impacting soil health, and the technology available to you when deciding rates. **Rate calculations** are highly dependent on the nutrient content of the product you are applying compared to what the crop needs.

TIMING

Nutrients should be applied when plants can uptake them. Consider whether spring, summer, fall, or split scheduled fertilizer timings are right for your crops. Rainfall can also have a significant impact on application success. For example, nitrate - a plant accessible form of nitrogen, is water soluble and will leach out of soil. Available technology will also impact nutrient application timing.

- **Fruit crops**
- **Row crops**
- **Vegetable crops**

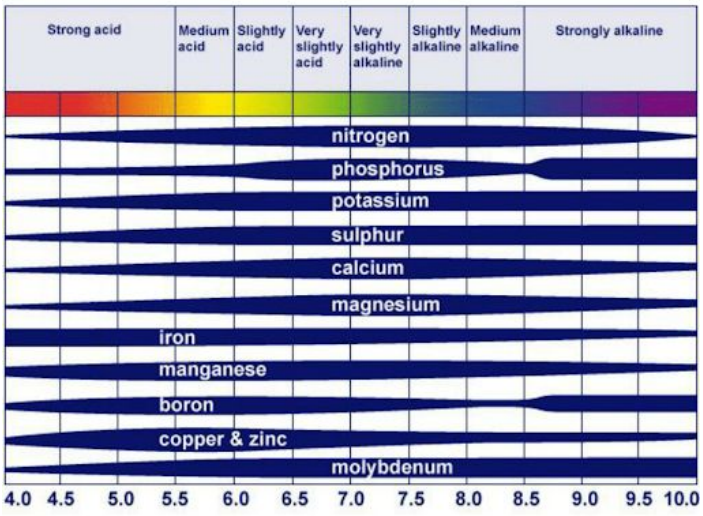
Process for Getting Started

As you get started with managing nutrition, it is important to understand plant nutrition fundamentals. This can include soil characteristics and nutrient movement.

SOIL CHARACTERISTICS

Soil pH and Nutrient Availability

- Soil pH is KEY. Make sure you know your soil's pH- especially before planting.
- The pH of the soil impacts the nutrient's ability to move within the soil and into the plants.
- The soil nutrient value (e.g. potassium in parts per million (ppm)) on a soil test is generally an estimate for plant available nutrients, not total nutrients
- Soil pH and available nutrients may vary greatly across a field. Sampling by zone (as described in **A Field Guide to Soil Sampling**) can produce more accurate results in variable soil.



Source:

Review of the non-NPKS nutrient requirements of UK cereals and oilseed rape - Scientific Figure on ResearchGate.

Available from: **https://www.researchgate.net**

Soil Texture

- Inherent to your farm- can't really change. Texture greatly impacts water retention and cation exchange capacity (CEC).
- Check out your farm's soil texture here: **Web Soil Survey**
- **Soil Organic Matter** fact sheet

Soil Organic Matter

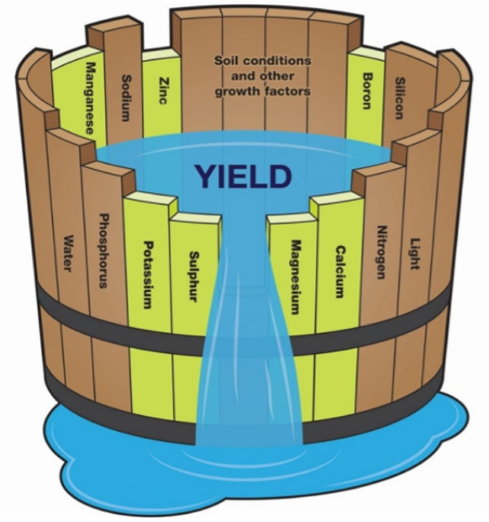
- Hard to build, easy to lose. Prevent soil organic matter loss by putting more carbon in than you take out (ex. compost, manure etc.).SOM is lost through tillage and crop removal. SOM can be built with cover crops and compost and manure application.
- Mineral soils in Michigan are generally <4% SOM, while organic soils (muck or peat) can be >30% SOM
- **Soil organic matter in cropping systems**

Cation Exchange Capacity (CEC)

- Dependant on your soil texture
  - Sandy soil = low CEC (<10)
  - Clay-y soil = high CEC
  - The more organic matter in your soil- the higher the CEC
- **Calculating Cation Exchange Capacity, Base Saturation, and Calcium Saturation | Ohioline**

NUTRIENT MOVEMENT

- **Knowing nutrient mobility is helpful in diagnosing plant nutrient deficiencies - Agriculture**
- **Plant-Soil Interactions: Nutrient Uptake | Learn Science at Scitable**
- **3.3 Roots – The Science of Plants**
- **Vegetative plant parts | OSU Extension Service**



According to the Law of the Minimum, your crop can only perform as well as the most restrictive nutrient allows for, even if all other nutrient needs are met. Addressing the holistic nutrient availability of your soil allows for maximum yields.

Disclaimer. For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 1

COMMON QUESTIONS

01 How do I soil test?

In order for soil testing to help you in your nutrient management journey, you have to understand how to conduct the tests and how to interpret the results.

Soil tests are available through Michigan State University as well as multiple commercial companies. Be sure to review soil sampling procedures to get the most out of your test.

- **Get Started | MSU Soil Test**
- **A Field Guide To Soil Sampling**
- **LIME FOR MICHIGAN SOILS**

02 When do I soil test?

Soil test prior to planting and every 2-5 years. Regular testing ensures that your nutrient management plan is continuing to improve your soil health.

Try to test at the same time each year. General rule of thumb: sampling in spring will give you an idea of this year's nutrients, sampling in the fall will give you a more long-term outlook on soil nutrition.

03 I got a soil test, now what?

Once you have completed the soil test, it is time to decide a course of action. Review the following resources on understanding soil test reports prior to making soil amendments. Never hesitate to reach out to a local extension office for help interpreting results.

- **The Anatomy of a Soil Test Report**
- **Understanding the MSU Fertilizer Recommendation Program**
- **Soil Test Interpretation Guide**

04 How do I calculate the required nutrition based on my soil test?

Start with the example worksheet below to better understand how to calculate fertilizer rates.

- **Calculating fertilizer rates example worksheet by MSU Extension**
- **Soil test nutrient values to crop specific nutrient recommendations** (in case your soil test does not give recommendations)
- **Nutrient recommendations to fertilizer requirements**

05 Where do I source fertilizers?

Local agriculture stores and gardening centers have fertilizer. Consider the rates you already calculated when choosing ratios of products. Additionally, organic sources of fertilizer like manure will have lower rates of nutrition content.

When reading a fertilizer label, it will have three numbers that are usually referred to as the fertilizer analysis. These numbers represent the percentage of Nitrogen(N), Phosphorus(P), and Potassium(K) and will be presented in the format N-P-K. If there are any other nutrients outside of those, it will be listed further down the label. Veteran growers might refer to a fertilizer as its analysis so if someone says they applied 20-20-20, they're talking about their fertilizer!

06 How do I calculate lime rates based on soil test recommendations?

Start with a review of lime requirements based on soil type and lime source options: **Lime for Michigan Soils Factsheet**



RESOURCES & PARTNERS

Necessary Resources

Macronutrients and Micronutrients

Both are required for plant growth and development, but macronutrients are required in larger quantities than micronutrients within plants.

Nitrogen

- Nitrogen in the Plant | MU Extension

Potassium

- Elevate your knowledge of the potassium cycle – Crops and Soils
- Potassium Uptake and Ohio Crop Response | Ohioline

Phosphorus

- Understanding phosphorus fertilizers | UMN Extension

Calcium

- Beware of Liquid Calcium Products
- Understanding Plant Nutrients: Soil and Applied Calcium — The Learning Store

Magnesium

- Magnesium for crop production | UMN Extension

Iron

- Understanding Plant Nutrients: Soil and Applied Iron — The Learning Store

Manganese

- Manganese in Minnesota soils | UMN Extension

Copper

- Copper for crop production | UMN Extension

Zinc

- Zinc for crop production | UMN Extension

Boron

- Boron for Minnesota soils | UMN Extension

Chloride

- Chloride is Crucial for Crops! | Extension News and Publications

Molybdenum

- Soil and Applied Molybdenum (A3555)

Soil Testing

- The Anatomy of a Soil Test Report
- Understanding the MSU Fertilizer Recommendation Program
- Soil Test Interpretation Guide
- Get Started | MSU Soil Test
- A Field Guide To Soil Sampling

Nutrient Movement

- Knowing nutrient mobility is helpful in diagnosing plant nutrient deficiencies - Agriculture
- Plant-Soil Interactions: Nutrient Uptake | Learn Science at Scitable
- 3.3 Roots – The Science of Plants
- Vegetative plant parts | OSU Extension Service

SMART Nutrition Management

- How To Get Started with Nutrient Management

Northeast Region Certified Crop Adviser Nutrient Management Study Materials

- Certified Crop Advisor study resources (Northeast region)

Cornell Soil Science Full Course

- PLSCS 2600 - Soil Science w/ Jonathan Russell-Anelli, Cornell University - YouTube

A Guide to Understanding Fertilizers

- A guide to understanding fertilizers | OSU Extension Service

Crop Nutrition 101

- Crop Nutrients 101 – Crops and Soils

Tri-State Nutrient Recommendations for Corn, Soybean, Wheat, and Alfalfa

- https://www.canr.msu.edu/news/revised-tri-state-fertilizer-recommendations-now-available

Cornell Soil Health Assessment Training Manual

- https://www.canr.msu.edu/foodsystems/uploads/files/cornell_soilhealth.pdf

Fertilizer Rate Calculation

- Calculations Used to Determine the Amount of Fertilizer Needed to Treat Turf

Lime for Michigan Soils

- LIME FOR MICHIGAN SOILS

Building Soils for Better Crops

- Building Soils for Better Crops - SARE

SARE Soil Health Resources

- Soil Health in Sustainable Agriculture - SARE

Nutrient Application Timing

- Fertilizer Placement and Timing

Composting Resources

- CORNELL Composting

Cornell Soil Health Assessment Training Manual

- https://www.canr.msu.edu/foodsystems/uploads/files/cornell_soilhealth.pdf

Fertilizer Rate Calculation

- Calculations Used to Determine the Amount of Fertilizer Needed to Treat Turf

Lime for Michigan Soils

- LIME FOR MICHIGAN SOILS

Building Soils for Better Crops

- Building Soils for Better Crops - SARE

Partners

SARE: Sustainable Agriculture Research and Education
https://www.sare.org/

USDA-NRCS: National Resources Conservation Service
https://www.nrcs.usda.gov/

PLANTS

Integrated Pest Management (IPM)



AUTHORS & INSTITUTIONS

Lindsay Brown, Tree Fruit Research Technologist, Penn State University
Erin Lauwers, Integrated Pest Management Educator, Michigan State University Extension
Emily Lavely, Tree Fruit Educator, MSU Extension
Derek Plotkowski, Fruit Educator, MSU Extension
Nicolle Ritchie, Field Crops Agronomy Educator, MSU Extension
Cheyenne Sloan, Blueberry and Small Fruit Educator, MSU Extension

SECTIONS

Section 1: Cultural Controls
Section 2: Biological Control
Section 3: Chemical Practices

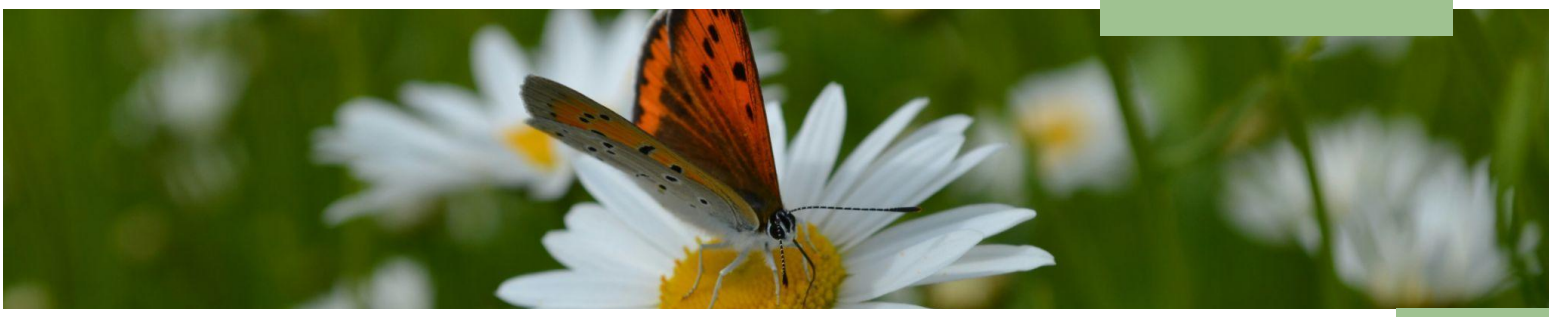
Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

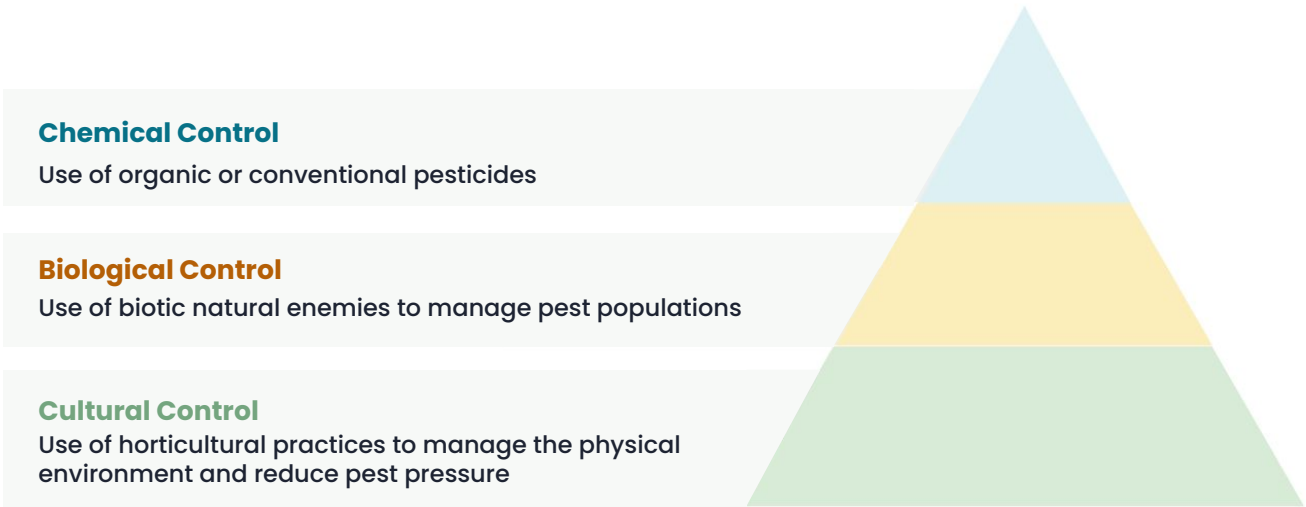
GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Integrated pest management (IPM) is the management of pest populations using a variety of practices. Pests are any organism that is detrimental to human activities. They include diseases, insects, vertebrates (including deer, birds, and moles), weeds, and nematodes. Crops provide food and shelter to many of these pests and they will try their best to benefit from your hard work! IPM gives you the tools to make sure your harvests are successful.

Integrated Pest Management Pyramid



We define IPM as pest ***management*** instead of control because total control over an outdoor environment is not our goal. The goal is low pest pressure, not *no* pest pressure. IPM practices try to strike a balance between cost of control measures and the benefit of retained crops. This is why we implement a multi-tiered approach illustrated in the pyramid above and detailed below to manage pest populations. The ***integrated*** approach involves prioritizing cultural and biological practices to minimize our need for chemical inputs.



When considering IPM strategies, start with manipulating the physical environment using **cultural control** methods (mowing, deer fencing, pruning and more) to set yourself up for success. Next, consider how natural enemies of your pests can be supported and introduced to balance pest populations with **biological controls.**

This can look like keeping a wildflower garden or releasing green lacewing eggs. Finally, if pest populations continue to build, consider judicious use of **chemical controls** (either conventional or organic) to effectively reduce the pest populations.

How To Get Started

When planting crops, it is critical to think through IPM concerns from the start. Even when planting grass, we commonly cover the ground with straw to prevent birds from eating the seed! Early intervention prevents pest populations from expanding beyond the scope of your management. This early intervention is dependent on information input— knowledge is the most powerful tool in your IPM toolbox.

When starting to grow a crop, familiarize yourself with the common pests and diseases so that you can more readily identify and treat your issues. If you are unable to identify your pest, online resources like **iNaturalist** and **PictureThis** can help you quickly check a guess. We also have statewide resources available online through **AskExtension** and via mail with the **plant and pest diagnostics lab**. When directing your question to MSU experts, please include high quality pictures (close ups of issues, distance shots in context), details about the site history, management practices, and current issues.

Once you understand which pest is causing you problems, you can identify the best IPM solution for your situation. IPM is a continual process and may require multiple strategies over time to manage the pest issue.





SECTION 1

CULTURAL CONTROL

Cultural practices are the foundation of the IPM pyramid. When we talk about "cultural" in this context, we mean horticulture more than fine wine or opera! Pests use crops as their source of nutrients and/or shelter. If we can adjust the growing environment to limit their access to these two factors, it will limit pest pressure before they get going. Some examples of cultural practices are below.

- Install deer fencing around your cultivated land to limit deer browsing.
- Plant disease free plant material and use disease free potting mix.
- Prune trees to open up the canopy. Fungal diseases prefer dark and humid environments.
- Consider your plant nutrition from the start. Healthy plants are less likely to become diseased.
- Use tree guards to prevent rodent damage.
- Manage weeds through well-timed and consistent mowing or cultivation.

Primary Considerations

These practices are ***proactive*, not *reactive***. It is much easier to prevent pest issues than it is to fix issues!

Cultural practices are year-round considerations.

- In orchard systems, winter pruning, summer mowing, and fall leaf mulching all contribute to lowering pest pressure.



Familiarize yourself with the common pests and diseases associated with your crops and regularly check for them in your field. Set up a weekly scouting schedule throughout the season. Earlier interventions are more effective!

- Tip: **MSUE Enviroweather** has models that predict when pests and diseases will be active in your area based on local weather data.

Identify what preventative strategies make sense for your cropping system.

- Use chicken wire to reduce herbivore browsing in raised beds.
- Research crop rotations prior to planting to limit disease/host compatibility.
- If you are making compost, do not include weeds as compost piles may not reach high enough temperatures to denature seeds.

Over time, you will identify your key IPM challenges. Refining your cultural practices to target these issues will help you continue to manage your pests.

- If Spotted Wing Drosophila is a major issue for your blueberries one year, you can install insect exclusion netting the next.
- If you have a fungal leaf disease, consider flail mowing leaves in the fall and applying urea. This will increase decomposition and reduce disease pressure in the next year.

Process For Getting Started



PLANT MATERIAL SELECTION

Selecting disease resistant plant material can reduce disease pressure over time. Disease resistance is never a guarantee, but it can reduce disease pressure.

Ensure that your plants are compatible.

- Can those fruit trees cross-pollinate?
- Are there **black walnut trees** near your garden?
- Do you have apple trees and cedar or juniper trees on your property (**Cedar-Apple Rust**)?

Ensure that your selected plants are non-invasive. Planting something like mint can be an irreversible decision!

SITE SELECTION

Ensure that your planting location has enough sunlight and drainage for the selected crop.

Soil testing with Michigan State University can set you up for success!

WHAT STEPS CAN YOU TAKE TO REDUCE PEST PRESSURE AS YOU BEGIN?

Reduce weed pressure by **solarizing** soil.

Limit vertebrate damage by installing fencing and tree guards.

Keep pathogens in mind when deciding plant spacing and placement. Pathogens thrive in dark, humid environments. Airy and light plantings are less likely to become diseased. Pruning, thinning, and less dense spacing can help.

CREATE A ROADMAP WITH SEASONAL GOALS

This can look like crop rotations throughout the year, winter pruning, spring fertilization, removing plant debris, and more.

Identifying specific goals for each season will make cultural practices easier to keep up with.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 1

COMMON QUESTIONS

01 How do I diagnose plant and pest issues in my planting?

It's important to make sure that you are familiar with the "usual suspects" that might affect your selected crop. If you are still stumped, reaching out to an expert in the field is a great next step. However, not all diagnostic requests are created equally. There are a few key things to remember when sending someone samples/pictures in order for them to diagnose what is wrong with your crop.

- When it comes to pictures, generally the more, the better. It's always a good idea to include a picture of the mystery affliction up close, a whole picture of the affected plant, and a farther away picture to give the diagnostician an idea of what the environment looks like.
- Take note of what plant parts are being impacted (leaves, fruit, bark, etc.). Identify where the issues are taking place (high or low, inside or outside of the canopy, all plants or just a few).
- Reflect on whether the impacted areas have different physical environments (i.e.: field drainage, sunlight exposure, weed density, woodline proximity).

02 What are common cultural practices for my crop?



Different cropping systems require different IPM strategies, especially for cultural practices. **Vegetable**, **nursery crops**, **field crops**, and **fruit crops** all require unique approaches. Research your specific crop prior to starting.

03 What if I already planted my crops? How do I start my IPM practices?



There is no time like the present! While it is easier to incorporate cultural management techniques from the start, it is certainly not required. Consider your IPM challenge areas and how incorporating an annual rotation of cultural management practices can help your crops today.

04 How do I choose which crops to plant and where to plant them?



Always get a soil test done prior to planning your cropping systems. This can give you information regarding any **soil contamination** like lead. Soil that has been exposed to old paint or historically used as a dumping ground is more likely to have heavy metal contamination.

Soil testing will also inform your **soil amendment** choices. It is much easier to amend soil prior to planting crops – particularly perennials. While adding nutrients to the soil can be fairly straightforward, amending soil texture or pH is a much bigger undertaking.

Amending soil texture or pH can take several months to years before significant results are achieved. Plants have an ideal pH for gaining nutrients based on their adaptations. For example, blueberries thrive in low pH soils and asparagus thrive in high pH soils. It is often easier to align your crop choices with the texture and pH of your soils than fundamentally altering your available soil.

05 How do I scout?

- **Visual Inspection:** Take representative, random samples of your cropping area. Be sure to visually inspect all levels of the canopy and both the interior and exterior of the canopy. Flip over leaves and inspect all plant parts. A good rule of thumb is to inspect 50 leaves/acre.
- **Pheromone Traps:** Once you have identified common pests of your crops, you can order **pheromone traps** online. These traps consist of a reusable plastic shell, a replaceable sticky card that catches the insects, and a luring pheromone that is specific to the insect of interest. Check these traps on a weekly basis, keep track of population changes over time, and change pheromone lures on a monthly basis.
- **Action Thresholds:** Each pest has an **action threshold**. The threshold may be expressed as insects/plant, percent defoliation, insects/trap/week, etc. Once these thresholds are crossed, you can enact further IPM mitigation strategies.

06 Where do I source my plants? What if I am looking for disease resistant varieties?

- Look for reputable nurseries that have the varieties you're looking for. In some cases supply of your desired trees or plants may be limited and you may have to wait up to a couple years for the nursery to stock them.
- Some nurseries will specialize in disease resistant or unique varieties of plants.
- For field crops, talk to local seed dealers to learn what varieties they offer and find information on disease resistance, yield, etc. Much of this information is also available online for each variety.
- Talk to other farmers about where they purchased their stock.



SECTION 1

RESOURCES & PARTNERS

Necessary Resources

MSU Soil Testing

MSU Soil Test

Soil Quality

Introduction to Soils: Soil Quality

Soil Management

Introduction to Soils: Managing Soils

Pheromone Traps

Pheromone Traps

Scouting

- **General:**
  Taking Stock: The Basics of Crop Scouting - SARE

- **Row Crops:**
  Crop Scouting Basics for Corn and Soybeans

- **Vegetable Crops:**
  Scouting for Pests and Diseases in Vegetable Crops

- **Fruit Crops:**
  Scouting 101 | Purdue University Facts for Fancy Fruit

Vegetable Crops

Chapter IV: Cultural Practices

Nursery Crops

Cultural Practices | NC State Extension

Row Crops

Cultural Practices: To Give the Crop Advantage : Pivot and Grow

Fruit Crops
Integrated Pest Management: Cultural Controls – Wisconsin Fruit

Solarizing Soil
Using the sun to kill weeds and prepare garden plots | UMN Extension

MSU Plant and Pest Diagnostics Lab
Plant & Pest Diagnostics

MSUE Ask Extension
Ask Extension

PictureThis
PictureThis

iNaturalist
iNaturalist

MSUE Enviroweather
MSU - Enviroweather

Partners

SARE
Cultural Control Archives - SARE



SECTION 2

BIOLOGICAL CONTROL

When considering IPM strategies, it is important to think about how ecosystems function. Biological control is pest management with natural enemies (predators, parasitoids, and pathogens). After all, the enemy of my enemy is my friend!

Natural enemies have evolved to specifically balance out pest populations. These natural enemies are often called "**beneficials**", especially insects. However, we must take care that the beneficials we are encouraging do not become pests themselves.

Successful biological control requires research and careful planning to succeed. Biological control includes a few different strategies to encourage beneficials. First, we can conserve existing populations with conservation strategies. We can also augment existing populations by introducing more natural enemies to the cropping system. Finally, classic biological control techniques involve establishing new populations of beneficials long term to control pests.

Biological control can be a double-edged sword. When implemented correctly, it can drastically reduce pest populations in a region with limited environmental impacts and without pesticides! When used incorrectly, it can introduce invasive species to an area.

Cane Toads in Australia and Asian Carp in the Mississippi River are classic examples of importation biological control gone wrong. The USDA has very strict guidelines for implementing new species now. Successful biological control requires research before implementation.

Primary Considerations

Conservation Biological Control

The first step of biological control is enhancing natural populations of beneficials. Just like we can reduce pests by limiting their access to food and shelter, we can promote beneficials by providing them with hospitable environments. There are many options for implementing this strategy.

- Plant a native flower field or strips adjacent to your crops.
- Use clover as a cover crop.
    - Be sure to mow it prior to applying insecticides in the spring!
- Reduce insecticides that can target beneficial insects.

Augmentative Biological Control

If you are confident in a pest identification, you can research their primary biological controls. Many mass-reared beneficials are available online. They can be placed in a cropping system to temporarily boost beneficial populations.

- Typically, these are insect populations that will not establish in your area successfully.
- Keep in mind that an insect can be beneficial in one crop and a pest in another. Research across your crops prior to introducing anything.
    - Lady bugs (scientifically known as lady beetles) are a beneficial insect in tree fruit and eat Wooly Apple Aphids. They are also a pest in grape production and can easily contaminate juice.

Classic (Importation) Biological Control

The classic model of biological control involves identifying a new invasive species that has no natural predators, researching its natural predators in its center of origin, and establishing those predators in the new environment after extensive testing. These two species can then keep each other in check.

This is typically done by USDA and university cooperation. While established populations can reduce pest pressure for growers, they do not independently implement classic biological control.

- For example, MSU researchers are currently introducing the Samba wasp to control the invasive Spotted Wing Drosophila in commercial fruit cropping systems.

Process for Getting Started

Identify areas on your property that can be designated as beneficial habitats. This can support pollinators as well as parasitoids and predators.

- Would cover crops, prairie strips, or a wildflower meadow work best for you?
- Investigate the **numerous funding resources available** to support this!

Research your regularly used insecticides.

- Do they harm beneficial insects?
- Are less environmentally impactful or "softer" products available to you?

Research and be able to identify common pests and beneficials in your cropping systems.

- If you see a pest population increasing in your scouting, look into potential biological control options.

Disclaimer. For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 2

COMMON QUESTIONS

01 How do you identify "good" bugs?

Research the common beneficial insects associated with your crops. Being able to identify their eggs and adult stages is very useful. The **Natural Enemies Handbook** is one of several excellent resources for this process.

02 What kind of beneficials do I need?

Apart from pollinators, beneficial organisms are highly specific to your crop selection. While we discuss beneficial insects most here, there are also beneficial microorganisms. For example, MSU is working to establish Ovavesicula popilliae populations, a fungus that grows in Japanese beetles' guts and kills them, in Michigan golf courses and fruit crops.

03 How can you support beneficial populations?

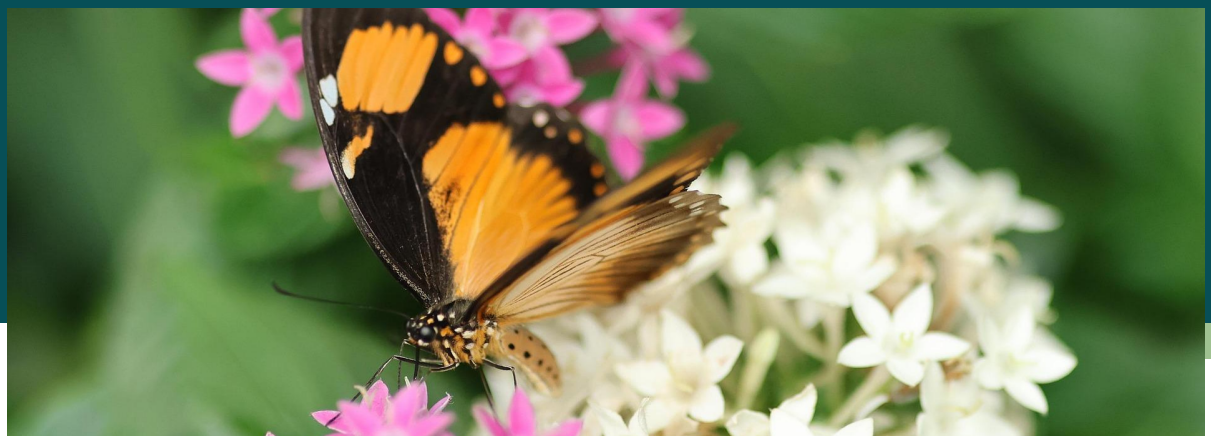


- Plant cover crops and plants that **attract beneficial insects** adjacent to your crops. There are multiple grants available that will support your work to establish beneficial and pollinator habitats.
- Research the impact that the chemical pesticides you would like to use have on beneficial insects. Select less impactful products when possible.

04 What is an invasive species and how can I identify them?



Invasive species are non-native organisms that do not have an existing check and balance system in their new ecosystem. As such, they can rapidly increase their populations with limited restrictions. The **Midwest Invasive Species Information Network** has valuable information on what invasive species are in your area. Consider invasive species whenever you introduce organisms to the environment, whether they are your crop of choice or a biological control agent.



SECTION 2

RESOURCES & PARTNERS

Necessary Resources

Orchard Pesticide Effects on Natural Enemies Database

OPENED - Orchard Pesticide Effects on Natural Enemies Database

Funding opportunities for establishing pollinator habitat

Funding opportunities for establishing pollinator habitat

Attracting Beneficial Insects

Attracting Beneficial Insects

Natural Enemies Handbook

Natural Enemies Handbook: The Illustrated Guide to Biological Pest Control

MSU Fruit Pest and Beneficial Search

Fruit Pest and Beneficial Search

MSU Vegetable Insect Guide

Insect Guide for Field Crops

Partners

MAEAP

MDARD - Michigan Agriculture Environmental Assurance Program (MAEAP)

Midwest Invasive Species Information Network

Midwest Invasive Species Information Network

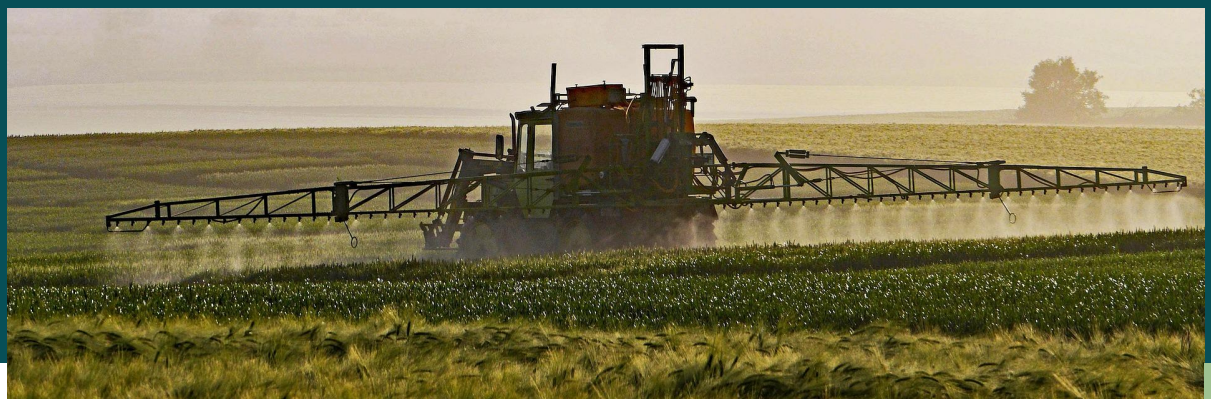
USDA Animal Plant Health Inspection Service

Biological Control Program | Animal and Plant Health Inspection Service

Sustainable Agriculture Research and Education

What We Do - SARE





SECTION 3

CHEMICAL PRACTICES

We often like to say “everything is a chemical,” but while true this statement isn’t always helpful. Here we are talking about interventions using either naturally derived or synthetically produced chemicals typically applied by spraying (but also potentially granules, dust, or other methods). A pesticide is any material that is applied to kill, attract, repel, or otherwise regulate pests. Pesticides include disinfectants, fungicides, herbicides, repellents, and defoliants. We all use pesticides in our lives whether we’re cleaning a bathroom or preventing our dogs from getting fleas and ticks. They can be fast, effective, and easy to use. However, they can also be harmful to human health and the environment if used incorrectly.

Whether you are taking an organic or conventional approach to managing your crops, you will be using pesticides to manage pests. Consider how you will acquire and handle pesticides and how they can impact the environment in different ways.

Primary Considerations

Pesticide Access

Pesticides are in one of two categories: **Restricted Use** and **Unclassified**.

- **Restricted Use** pesticides require a pesticide applicator license from MDARD to purchase and use. These products are tightly regulated and are more potentially hazardous to health and the environment.
- **Unclassified** products are available to the public and can be picked up ready-to-use at big box stores. They are generally less concentrated and less hazardous than restricted use products, but still require caution.

Pesticide Safety

- You must fully read the label prior to using any pesticide. The label is the law and dictates pesticide use limits and safety concerns.
- Wear the recommended personal protective equipment (PPE). The baseline PPE is gloves, goggles, pants, and long sleeve shirts.
- Wash your hands after handling pesticides!
- Hazard = Toxicity x Exposure
    - When using a product, we cannot change its toxicity. However, we can take reasonable precautions to limit exposure.

Pesticide Terminology

Mode of Action: How products work to control a pest(s)

- Systemic pesticides are absorbed through tissues and transported elsewhere where the pest encounters it through feeding.
- Contact pesticides must come in direct contact with the target pest.

Selectivity: What range of pests a given product can affect

- Non-selective products kill all related pests.
    - Some herbicides kill all green plants that get a sufficient dose.
- Selective products kill only certain weeds, insects, plant pathogens.
    - Other herbicides only kill broadleaf weeds, but not grasses.

Persistence: How long a product can remain active in the environment

- Residual pesticides can remain active for weeks to years.
    - Herbicides used around road guard rails have a long residual effect.
- Non-Residual pesticides are inactivated immediately or within a few days after application.
    - Some herbicides do not remain active in the soil once applied.
- Persistence also impacts the Reentry Interval (REI) and Preharvest Interval (PHI). These periods can be hours or days long depending on the label.

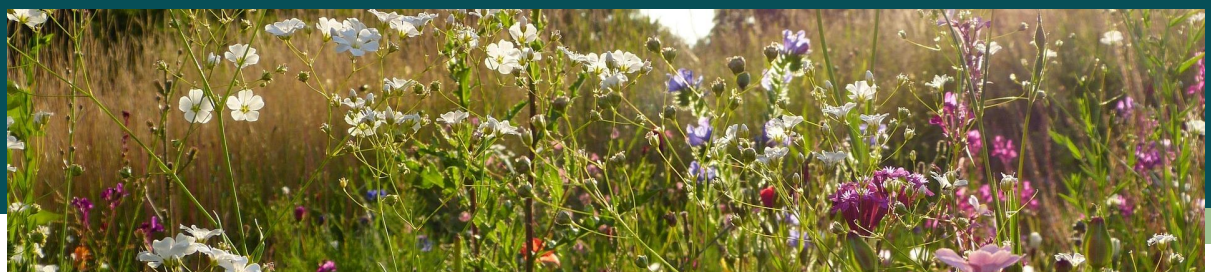
Reentry Interval (REI): How long you must remain out of a pesticide treated area post application without proper PPE.

Preharvest Interval (PHI): How far ahead of the harvest date you can legally apply a pesticide.

Process for Getting Started

- **MDARD** handles pesticide certification within Michigan. If you are interested in using restricted use pesticides, they have resources for training and certification.
- MSU also has a pesticide safety and education program (**PSEP**) that can provide resources.
- Learn how to **read pesticide labels** before you get started with restricted use or unclassified pesticides. The label is the law! It has information that can help you effectively protect yourself and make the most effective pesticide applications possible. The label contains a lot of information and can be confusing at first.
- Review **safe use practices** to minimize your personal and environmental risk prior to making any applications.
- Identify what spray equipment is right for your cropping system. Whether you use a **backpack sprayer** or an **air blast sprayer**, learn how to operate and calibrate your equipment before use.
- Establish a record keeping system for your spray conditions, product use, and impact on pest populations. This is both legally required for restricted use pesticide applications and very helpful for evaluating spray program efficacy.

Disclaimer. For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 3

COMMON QUESTIONS

01 How do you become a certified applicator?

MDARD handles pesticide applicator certification in Michigan. Generally, you study and take a test.

Take the private test if you are applying restricted use pesticides on your own farm only.

Take the Commercial test along with a specialized test based on your crop if you are applying pesticides on public land, for hire, or research.

This certification lasts for three years. You can gain recertification credits to indicate that you are getting continued education. Alternatively, you can retake the tests every three years.

02 How do you buy pesticides?

You can purchase unclassified pesticides online or at big box stores like Lowes, Home Depot, or Tractor Supply Company.

Michigan currently has 242 restricted use pesticide dealers according to **MDARD**. Contact a local supplier for more information.

03 How do you read a label?

Fully reading the label prior to use is essential for safe and legal pesticide handling. There are multiple resources available, including these from the **National Pesticide Information Center** and the **EPA**, that breakdown the important components of the label and what they mean. Keep in mind that labels change over time and reading is required to keep up on these changes.

04 How do I know when/what to spray?

Pesticide applications should be made based on scouting as well as plant growth stages. Many plant diseases must be managed proactively. As such, fungicides and bactericides are often applied based on past disease symptoms, current plant growth stages, and predicted weather conditions for the week. For example, if you have had apple scab in your apple trees in the past, you know that spores are still discharging in the spring, and it will be a wet week with great infection conditions, then you should apply preventative sprays. However, insecticide applications are based on action thresholds and your scouting. If a pest population is increasing and you do not have another solution available to you, then it is time to spray insecticides.

You should also consider **pesticide resistance**. You should research which pests have developed resistance to which products in your area. Keeping up to date with MSU product recommendations will help. Applying pesticides to pests that have partial or full resistance can make the resistance issue worse without adequate control of the pest population.

Finally, take pesticide selectivity into consideration. We generally have broad spectrum pesticides and narrow spectrum pesticides. Broad spectrum pesticides will interact with multiple organisms where narrow spectrum pesticides have specific pests they can harm. There is an ongoing debate about which ones are better for the environment. On one hand broad spectrum pesticides are much more likely to interact with non-target organisms and impact the local environment than more selective products. On the other hand, they require fewer applications of pesticides (saving time, money, and product) and are less likely to develop resistance issues over time than selective pesticides. It is up to you to decide which of these arguments matters more to you and your management practices.

05

What kind of equipment do I need?



Photo by Michigan Department of Agriculture and Rural Development

This is highly dependent on your scale of production. If you are a small scale producer, you can use a backpack sprayer, which can be hand pumped or battery powered. As you scale up, the options become increasingly diverse. You can look into purchasing spray equipment second hand from other local growers to make a more cost effective choice while your operation grows. Your pesticide applications are only as good as your equipment and product choice.



Photo by Michigan Department of Agriculture and Rural Development

SECTION 3

RESOURCES & PARTNERS

Necessary Resources

MSU IPM Hub

Integrated Pest Management

MSU IPM Academy

Integrated Pest Management Academy

MDARD Restricted Use Pesticide Dealers

MDARD - Restricted Use Pesticides Dealers

Pesticide Label Reading

- How to Read the Label – Pesticide Environmental Stewardship
- Reading Pesticide Labels

Sprayer Calibration

- Six Steps to Calibrate and Optimize Airblast Sprayers | WSU Tree Fruit
- Easy Calibration for Backpack and Canister (Handheld) Sprayers | USU

Bulletins Live! Two

Bulletins Live! Two

Pesticide Terminology

Pesticides Glossary

Partners

MDARD

https://www.michigan.gov/mdard

Pesticide Educational Resource Collaborative

https://www.pesticideresources.org/wps/

IR-4

https://www.ir4project.org/

Pesticide Safety and Education Program

https://www.canr.msu.edu/psep/

National Pesticide Information Center

https://npic.orst.edu/

Poison Control

https://www.poison.org/

PLANTS

Seeds



AUTHORS & INSTITUTIONS

Jenna Falor, Field Crops Educator, Michigan State University Extension
Jonathan LaPorte, Farm Business Management Educator, MSU Extension
Benjamin Phillips, Vegetable Specialist, MSU Extension
Steve Whittington, Field Crops Educator, MSU Extension

SECTIONS

Section 1: Field Crops
Section 2: Vegetables

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Raising a profitable crop begins with selecting the right seed product to plant on your farm, this can be done by identifying important characteristics for a successful crop. Just as no two farms are exactly alike, neither are the fields in which you'll be planting. You need to understand the field conditions and potential environment you expect a plant to grow in. Then, select varieties that meet those expectations.

How To Get Started

It is important to remember that different factors on your farm such as soil, location, weather, and climate can make it difficult early on in your career to understand what seed will perform well on your farm. Determining various plant attributes can help navigate factors outside of your control that will inevitably affect your farming season.



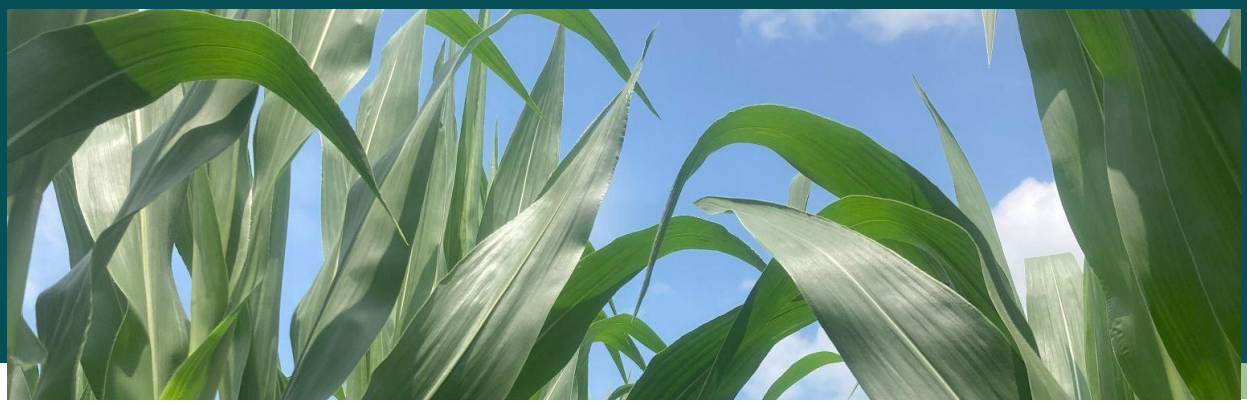
Important attributes to include when deciding what to grow include: growth factors that focus on plant health and survivability, harvest condition and quality, tolerance or safety concerns when using pesticides, and even disease resistance or susceptibility.



Another consideration is to identify when you need a plant to reach maturity. Many plant varieties will list maturity by at least one of two terms: ***relative maturity (RM)*** and ***growing degree days (GDDs)***.

Relative maturity focuses on harvest maturity, or when a crop can be harvested with minimal loss or damage. Growing degree days focus on thermal accumulation, or heat units, needed for a plant to reach reproductive maturity. Reproductive maturity can often be reached before relative maturity. Often times, the importance of relative maturity or growing degree days is dependent on when crops will need to be harvested. Beginning farmers who raise field crops often focus on relative maturity to meet standard grades for grain. Alternatively, vegetable growers may rely on growing degree days to harvest crops for fresh market sales.

When selecting what to plant, it helps to start with the end in mind. Marketing is a very important component of owning and operating a farm business. It is especially important when considering what to produce. For example, beginning farmers should think about who they will be marketing their crops to, how saturated the market is in their region, and the value proposition they have for the marketplace.



SECTION 1

FIELD CROPS



There are typically seed guides available from seed companies for field crops. These guides, while useful, can be a little tricky to understand if you aren't used to looking at them because every company sets them up slightly differently. Even with different set ups most companies include some common information:

Primary Considerations

- Growth characteristics
- Harvest timing, condition, and quality
- Costs and their impacts (i.e., planting, harvest)

Process for Getting Started



Variety numbering systems are the conventions by which companies name their different seed options. These conventions may use a combination of abbreviations for their company name, relative maturity (RM) numbers, and possibly trait information to identify varieties. An additional characteristic of a numbering system is it may the trait package, that is designed to protect the plant against specific pesticide damage.

Seed guides offer information on a number of different plant attributes. Often these attributes are accompanied by a rating system An example is a 1-9 rating system, with 1 being the best rating, but yet for another company 9 may be the best.. Some companies may forego numbers and instead use descriptive terms such as poor, good, very good, and excellent. It is important to understand which rating scale the company is using to define growth characteristics and other attributes.

Selecting the right seed for your farm starts and stops with profitability. You want to select varieties that are adaptable and will maximize yields across all acres. The economic returns related to seed and harvest costs are equally important, these include seed purchases, test weight, moisture shrink loss, and drying charges.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 1: FIELD CROPS

COMMON QUESTIONS

01 Are days of relative maturity the same as counting calendar days from planting?

Relative maturity is the days needed to reach harvest maturity or when grain can be harvested with minimal loss or damage. Under ideal field conditions, harvest occurs when grain has naturally dried to a desired moisture content. However, weather can impact how long it takes to reach ideal moisture levels. Temperature, humidity and water availability can delay or speed up the drying process. Due to weather, relative maturity days should not be considered the same as calendar days from planting. For more information, visit the MSU Extension presentation on Optimal Maturity Selection in Corn and Soybeans (https://www.canr.msu.edu/agronomy/uploads/files/2021_Optimal_Maturity_Selection_in_Corn-Soy.pdf).

02 What are trait packages and how do they work?

In addition to pesticide use and disease ratings, seed varieties may be genetically modified with additional management attributes. When a plant is modified, and its resistance is not naturally occurring this is referred to as genetically modified organisms (GMOs) or simply "traits." Plants with genetic traits may be able to provide their own protection against pests, injury from pesticides, or environmental stress conditions. For more information, visit the Handy Bt Trait Table for U.S. Corn Production (https://www.texasinsects.org/bt-corn-trait-table.html).

03 Does a higher disease rating mean I won't need to use fungicides on my plant?

A better rating indicates the plant is less susceptible to disease development and injury, which means limited impact to plant health and yield. Fungicides may still be needed if environmental conditions favor disease presence or injury. Although a lot of data is not available on each disease, a general rule of thumb is that there is a higher chance of return on investment (ROI) when conditions are favorable for disease development. To learn more about diseases and management tips, visit the Crop Protection Network (https://cropprotectionnetwork.org/).

04 Why is planting population important when choosing seed to purchase?

Population density in a field is important to your decision when comparing seed options. Depending on growth factors, soil types and environmental conditions, higher or lower planting rates may be needed for a specific seed variety. In some cases, seed may be versatile and can be planted at different planting rates, depending on environmental conditions. Ultimately, you need to know the population options that go along with a potential seed purchase to identify the best fits for your fields. Planting rates also affect your overall cost per acre of seed planted. For example, a seed variety with a lower price per bag may have a higher cost per acre depending on the chosen planting rate. To learn more about planting considerations, visit the MSU Field Crops Virtual Breakfast session recording on Corn and Soybean Planting Considerations (https://www.canr.msu.edu/videos/corn-and-soybean-planting-considerations-1).

05 How do harvest costs factor into selecting what seed to plant?

Harvest time costs can also be helpful when comparing seed options. Commercial grain buyers will grade sold bushels based on a number of factors. Factors can include test weight, moisture content, kernel damage, heat damage from drying, and even non-grain or foreign material. Grain that is sold without meeting these standards is discounted by fee or reduced bushels. The most commonly used in seed selection is to look for better test weight and moisture ratings. For an example of the impact of harvest factors, visit Grain Test Weight Considerations for Corn from Purdue University (https://www.agry.purdue.edu/ext/corn/news/timeless/TestWeight.html).



SECTION 1: FIELD CROPS

RESOURCES & PARTNERS

Necessary Resources

Research & Recommendation Resources

- **MSU Field Crops website**: Source of research-based crop production recommendations and resources. Assistance is accessible through educational programs, fact sheets, bulletins, articles, websites, and individual contacts (https://www.canr.msu.edu/field_crops/index).
- **Bulletin E-3430: How to Read a Seed Guide (Corn Edition)** (Michigan State University Extension at https://www.canr.msu.edu/resources/bulletin-e-3430-how-to-read-a-seed-guide-corn-edition)

- **Handy Bt Trait Table for U.S. Corn Production** (authored by Chris DiFonzo, Michigan State University, at https://www.texasinsects.org/bt-corn-trait-table.html).
- **Crop Protection Network:** Provides unbiased, collaborative outputs on important issues affecting crops in the United States and Canada (https://cropprotectionnetwork.org/).

Educational Program Events

- **MSU Extension Virtual Breakfast:** This free weekly series for farmers and agribusinesses focuses on a wide array of relevant field crop pest and crop management topics during the growing season.
- **MSU Extension Field Crop Webinar Series:** An educational program where participants learn how to enhance their corn, soybean, small grain and forage production systems and have an opportunity to ask questions of MSU agriculture experts.
- **MSU Extension Crop and Pest Management Update Meetings:** Annual, in-person meetings held between January and February to help producers and agribusiness professionals prepare for the upcoming growing season.

Partners

- **Michigan Corn** – https://micorn.org/
- **Michigan Soybean Committee** – https://www.michigansoybean.org/
- **Michigan Wheat Program** – https://miwheat.org/



SECTION 2

VEGETABLES

Vegetable seeds are sold by seed breeders, or their partnering distribution companies. Open-Pollinated (OP) seeds can also be sourced directly from other growers through various exchanges. The plants that come from OP seeds will produce seeds that remain true-to-type as long as you can hand-pollinate or isolate flowers by time or space. When maintained for about 50 years, an OP seedline is considered Heirloom. Plants that come from hybrid (F1) seeds will not produce true-to-type seeds.



Primary Considerations

- Not many breeding companies are set up to sell directly to growers. They tend to focus on a selection of vegetables, and a diversified grower would not find everything they want with one breeder. Often it is best to go through a distributor that manages a portfolio of varieties of all types of vegetables from the breeders. It is common to buy more than one distributor.

- A good distributor catalog will include pertinent information, such as full color pictures, maturity times, hybrid/OP status, and disease resistance. An indication of the best planting window is also helpful. There are several planting windows throughout spring, summer, and fall. As an example, certain varieties of broccoli are better for the spring plant-to-summer harvest slot, and others are better for the summer plant-to-fall harvest slot.





- Several different types of seed treatments are offered for different situations, which can drastically affect cost. Beans, pumpkins, cucumbers, and corn are large seeds that are commonly direct-seeded into field soil with a protectant fungicide and insecticide coating. Small or irregular-shaped seeds, such as onions, carrots, and various leafy greens, are commonly coated with clay – a process called pelleting – to make them a more uniform size and shape for accurate planting. Sometimes these cosmetic coatings can include a fungicide or insecticide. It helps to ask the seed distributor. Seed priming is a process that pre-germinates the seed for quicker emergence before it is shipped to you, but it also reduces its shelf-life. Primed seed should be used within one season.





- Will you direct seed or transplant? Oftentimes transplanting requires less seed. If transplanting, the most commonly used cell-tray size for vegetables is a 72-cell tray. A light is a must for starting inside, and a germination chamber is helpful to get seeds up fast. A germination chamber adds heat and holds moisture, such as an electric tray warmer and lid. An old refrigerator with shelves and a crock pot with water in it for heat and moisture is a clever hack to get seeds to crack within a couple days. For chambers that exclude light, you must remove trays and place them into a place with light before the plants fully emerge to keep them from growing pale and stretched.

- Asparagus, rhubarb, horseradish, garlic, sweet potatoes, and potatoes are not commonly planted from true seed. Instead, they are planted from pieces of roots, stems, or bulbs. However, asparagus and rhubarb seed are readily available. Asparagus takes so long to develop into a harvestable plant that growers are best served by planting one-year old crowns. Rhubarb seed is only available for OP varieties, such as Victoria. Most other varieties are hybrids and must be cloned by root cuttings.



Process for Getting Started

- Grab a bunch of catalogs and read them over the winter.
- If you intend to save seed, read up on population, isolation and pollination requirements.
- Read up on field-seeders and transplant tray setups.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 2: VEGETABLES

COMMON QUESTIONS

01 How much seed do I need?

If you have never grown a particular vegetable before, figure out your area in square feet or acres. Then reference a plant population table found in the Knott's Handbook for Vegetable Growers resource below. If you have some idea of your preferred dimensions between plants, multiply that by the full length of your row, and the number of rows to figure out the number of plants you need. If you are direct-seeding you can then buy 1.5x-2x that amount and seed with some doubles and get a reasonable population that may require some thinning. If you are transplanting, you can buy less than 1.5x more seed and seed with more precision into trays.

02 What seed coatings are worth it?

Some vegetables have pests that attack them when they are most vulnerable at the cotyledon stage. Onions, cabbage, beans, corn, pumpkins and squash are all attacked by fly maggots when planted early in the season and insecticide seed treatments are helpful in this planting window, but not so much later on. Similarly, fungicide seed treatments are most helpful in the early season when soil is moist, and rain is frequent.

If you seed with equipment that attempts to singulate seed, such as Jang seeders, it can be helpful to invest in pelleted seed. The more uniform shape and size makes precision equipment work even better.

03 What seed equipment should I use?

New vegetable growers should start small; with the best hand-push equipment they can afford. Some units can be modified to be pulled by tractors if you see that in your future. The best all-around seeder is a Jang or one of its copycats. They are small, lightweight, accurate, and adjustable by hand. They operate with plastic rollers which can be 3D printed and can be retrofitted to a toolbar for multiple rows that are spaced uniformly. A cheaper option with similar accuracy (for large seeds) is an Earthway push seeder. A similarly priced option, the Cole Jr. seeder, will plant any sized seed imaginable with very little adjustment, but it lays them as a dribbled line that needs thinning later.

04 Is this genetically-modified (GMO) seed?

There are very few genetically-engineered vegetable seeds, and most require a special agreement for intellectual property protection. Some GMO sweet corn share genetics with their field corn counterparts, conferring caterpillar-killing compounds, and resistance to certain herbicides. There are some zucchini and summer squash that are genetically-modified to suppress virus symptoms transferred by aphids, and some potatoes that resist browning after cutting. Most recently an OP tomato has been developed with traits from snapdragons to create a purple cherry tomato that has increased vitamin content and a purple color all the way through the center of the fruit.

05 What if I can't plant right away?

Most vegetable seeds will last two years with minimal loss of germination potential. However, onions lose a lot of viability within two years, and by year five most vegetables will have an unacceptable germination rate. Storing seeds for the long haul will require air-tight storage containers and a freezer. For vegetative materials, like sweet potato slips, it helps to time their delivery with your anticipated planting window, but they can be held for a couple days wrapped in moist newspaper out of sun and away from extreme temperatures. Asparagus crowns, rhubarb, and horseradish root cuttings can be held in cool moist (but not saturated) conditions for several weeks. Potato tubers and garlic bulbs can hold well in most ambient temperature rooms for a couple weeks. If obvious mold symptoms can be seen, it is best not to plant them.



SECTION 2: VEGETABLES

RESOURCES & PARTNERS

Necessary Resources

- Seed saver's exchange saving guide
- Knott's Handbook for Vegetable Growers Table 2.3 (p 62), Table 3.7 (p 113), Table 3.9 (p 118).
- Stoke's Seed
- Rupp Seed
- Seedway Seed
- Clifton Seed
- Rispens Seed
- Johnny's Seed
- Territorial Seed
- Baker Creek Seed

PLANTS

Transplants & Grafting



AUTHORS & INSTITUTIONS

Benjamin Phillips, Vegetable Specialist, Michigan State University Extension

Derek Plotkowski, Ph.D., Fruit Educator, MSU Extension

Barslund Judd, Consumer Horticulture Educator, MSU Extension

SECTIONS

Section 1: Vegetable Grafting

Section 2: Fruit Grafting

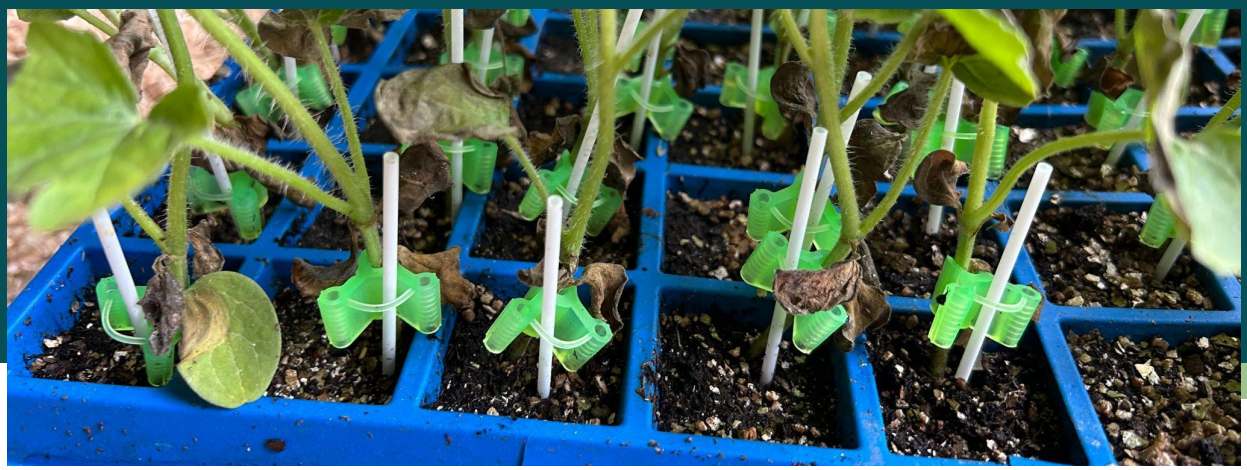
Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



SECTION 1

Vegetable Grafting

Do you have a seemingly unbeatable soil problem, such as nematodes and plant pathogens? New growers usually do not, unless they've bought a farm with a long history of vegetable production. However, if you did and do, then grafting vegetables may be worth the added hassle and expense. This advanced technique does not add much value to vegetables grown in a stress-free environment. In fact, they can yield less in certain high-nutrient environments.

In grafting, a variety is chosen as the "top" or "scion", and another is chosen as the "rootstock". Both are grown, and then combined.

Three vegetables that can be grafted interchangeably are **tomatoes, eggplants,** and **peppers**. Any standard or wild variety of these three species can serve as a rootstock for any other variety, with a wide range of effects, including increased thriftiness with water and nutrients, resistance to diseases, increased vegetative growth, and sometimes dwarfing. However, rootstocks should be chosen carefully to address your specific problem. The quality of the fruit is generally unaffected.

Watermelons and cucumbers can also be grafted onto a rootstock made from a special breed of gourd, but a bad combination of scion and rootstock can affect the flavor of the watermelon. It is much more important to choose compatible varieties for this case. The primary interest in grafting cucumbers is to make the scions more cold-resistant.

How to Get Started

Identify your problem. For example, Verticillium wilt in eggplant, or nematodes in hoophouse tomatoes, or Fusarium in field-planted watermelon.

Browse catalogs for varieties that are known to be resistant to the stressor. Sometimes there are specific sections for rootstocks. In the case of tomato, eggplant, and tomato, a standard variety that is resistant to the issue might work. For example, most tomatoes are naturally resistant to Verticillium and can be grafted to eggplant as a rootstock. For tomatoes, peppers, or eggplants, it doesn't necessarily need to be a special rootstock variety. With all the combinations available, it is often best to have grafted plants made for you by a greenhouse operation with experience in these matters.



Primary Considerations

SPACE

If you graft your own vegetables you will need twice the amount of space to grow both the rootstock and scions. You will also need a special dark or shaded space to heal the grafted plants with 95% humidity for about two weeks.

TIME

You will need to figure out whether or not you need to start your rootstock and scion seeds at the same time, or stagger them due to the tendencies of each variety. True rootstock varieties often germinate and grow faster and so are started after scions. It helps to have colder and warmer areas in the greenhouse to slow down or speed up growth. As for your transplanting schedule, you will also need to factor in the extra two weeks of healing where the plants basically don't grow.

SIZE

When scions and rootstocks have stems about 2 mm thick, it's time to graft. If there is a size difference it is better to have thicker rootstocks than to have thicker scions.

EFFICIENCY

It helps to have a team of people to graft, and to work such that you don't end up with a bottleneck in the process that leaves ungrafted plants to wilt for too long.

SUPPLIES

Grafting clips are a must! The most versatile clips look like two clear soft plastic tubes mated together; one tube is complete, and one tube has a slit in it. When you squeeze the complete tube, it opens the other tube to clip onto the graft union. Then, the complete tube serves as a guide for a coffee stirrer stuck through into the potting media to hold the plant upright.

Process for getting started

- Start small. Just do enough for one row of tomatoes, or about 25 plants.
- Seed both sets of plants appropriately so that they will have 2 mm thick stems at about the same time.
- Gather your team to set up a good flow for the work. One person to cut and throw away rootstock tops, one person to cut and collect scion tops, and two people actively grafting the scion tops to the rootstock bottoms. The cuts on both the rootstocks and scions should be a 45 degree angle.
- After the grafts are made, they need to be moved to a dark and very humid space so that their tissues heal together. Since the vascular systems of both the rootstock and the scion are severed, they will lose moisture. The solution for this is to reduce their cues to grow by blocking light, and reduce their moisture loss with high humidity (>/=95%).

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 2

Fruit Grafting

Do you ever wonder why apple trees in modern orchards look different from the apple tree you might have climbed as a kid? In modern agriculture, most fruit trees are grown as dwarf-sized, which is made possible by grafting our preferred varieties onto roots that control the size of the tree.

In grafting, a variety is chosen as the "**top**" or "**scion**", and another is chosen as the "**rootstock**". Both are grown, and then combined.

Apples, pears, peaches, plums, cherries: rootstock is primarily used for size/vigor control with secondary use for disease control.

In **grapes**, rootstock is primarily used for Phylloxera control in V. vinifera grapes, with secondary use for size/vigor control. Hybrid wine grapes and many table grapes are grown on their own roots.

Blueberries, strawberries, and brambles: grafting is uncommon, though possible.

How to Get Started

Almost all commercially producing fruit trees are grafted. Those interested in purchasing new trees should browse catalogs for rootstock varieties that are known to be resistant to the stressor that also fit your size requirements. If you're buying a common variety (e.g. Honeycrisp apples, Bartlett pears, Montmorency cherries) buy them already grafted from a reputable nursery. Specialty trees, including cider apples, may be less available to purchase pre-grafted. In that case you will need to collect budwood of the specialty trees and purchase rootstock and graft the trees yourself or by commissioning a professional. Some nurseries will take special orders, but it may take a few years before the trees are ready.

Some pitfalls associated with grafting fruit trees include viruses, incompatibility (sometimes this can take a few years to show), and high failure rate of grafting for beginners.



Primary Considerations

SPACE

Different size rootstocks will determine your spacing.

TIME

For tree fruit grafting is usually done in April, budwood is collected in March.

SIZE

For tree fruit and grapes the branches are usually pencil thick. If there is a size difference it is better to have thicker rootstocks than to have thicker scions.

EFFICIENCY

It helps to have a team of people to graft, and to work such that you don't end up with a bottleneck in the process that leaves ungrafted plants to wilt for too long.

SUPPLIES

Grafting knives, parafilm, wax, omega grafter for bench grafting.





Process for getting started

- Practice. Just do a few trees, try a few different methods.
- Gather your team to set up a good flow for the work. One person to cut and throw away rootstock tops, one person to cut and collect scion tops, and two people actively grafting the scion tops to the rootstock bottoms. The cuts on both the rootstocks and scions should be a 45 degree angle.
- After the grafts are made, they need to be moved to a dark and very humid space so that their tissues heal together. Since the vascular systems of both the rootstock and the scion are severed, they will lose moisture. The solution for this is to reduce their cues to grow by blocking light, and reduce their moisture loss with high humidity (>/=95%).

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



TRANSPLANTS & GRAFTING

COMMON QUESTIONS

01 Should I graft?

VEGETABLE GRAFTING

The situations where grafting works best are in hoophouses where tomatoes have been grown continuously for more than four years, and in fields where watermelons have been grown for more than three times in eight years. Also, nearly any field where eggplants are grown more than once in any span of time. These scenarios represent crops that suffer from a buildup of pathogens. Early hoophouse cucumbers can also benefit from grafting for cold tolerance.

FRUIT GRAFTING

Most growers purchase trees that have already been grafted, and for common varieties that is the easiest method. Growers who want to grow specialty varieties may have to propagate them on their own to get the trees they want.

02 How do I choose a rootstock?

There are more and more seed companies selling rootstocks, and they report pertinent information about their qualities that can help you decide if they are right for you. There are several “standards” that appear to have multiple-functions to cover a lot of different situations and with catchy names that make them easy to remember, such as ‘Maxifort’ tomato, ‘Carolina Strongback’ squash, and ‘Foundation’ pepper.

03 Why did my grafted plants die?

Grafting takes time to learn. The most common problems the new grafters encounter are uneven stem diameters and uneven cut angles that cause a poor graft union, and poor healing conditions that further stress them. One other common mistake grafters make is to water rootstocks and scions heavily before grafting. This actually makes them ooze water and form a thin layer of liquid that prevents the two surfaces from mating together well. It is common to experience 50-75% loss rates in the first year of learning.

04 Do grafted plants grow differently than non-grafted plants?

True rootstock varieties are especially vigorous and thrifty. They don't need as much pampering with irrigation and nutrients. In a stress-free environment they can become quite gluttonous and create rampant vegetative growth with less fruit production. Growers have had to dial back their fertility in particular. Rootstocks can also sometimes form stems from below the graft that bully their way past the scion's growth. These need to be pruned off. In some early experiments, certain bell peppers caused a dwarfing effect when used as rootstocks. Poor rootstock pairings with watermelon can create off flavors in the final product.

05 Can I sell the fruit of rootstock plants?

Rootstocks can sometimes send up a shoot from below the graft. The fruit of true rootstock varieties are typically not desirable in appearance or flavor, which makes them easy to sort out.

NECESSARY RESOURCES

VEGETABLE GRAFTING

- http://www.vegetablegrafting.org/ includes a detailed manual and pictures, as well as a rootstock reference resource
- How to Splice Graft Cucumber Plants by Wenjing Guan at Purdue Extension - includes detailed instructions, pictures, and a companion video
- Techniques for Tomato Grafting by Wenjing Guan and Steve Hallett at Purdue Extension - includes detailed instructions, pictures, and a companion video

FRUIT GRAFTING

- Dwarfed fruit trees, Tukey
- The Bench Grafter's Handbook: Principles & Practice; Humphrey

SOIL HEALTH

Introduction to Soil Health



AUTHORS & INSTITUTIONS

Christina Curell, Cover Crop and Soil Health Educator, Michigan State University Extension
Vicki Morrone, Academic Specialist, Michigan State University
Christine Charles, Field Crops and Regenerative Agriculture Educator, MSU Extension
Sarah Zeiler, Environmental Management Educator, MSU Extension

SECTIONS

Section 1: Soil Physical Properties
Section 2: Soil Chemical Properties
Section 3: Soil Biological Properties

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES

Beginning Farmer
Resource & Decision-Making Guide



Soil Health

INTRODUCTION

Soil is one of the most important resources for farmers. It's where plants grow, and it supports all life on the farm. Many cultures throughout history have understood how valuable soil is. Early farmers were likely amazed to see how seeds placed in the ground would sprout and grow into food year after year.

Soil is more than just something underfoot—it's the foundation for growing healthy crops. It holds water and nutrients, supports plant roots and provides a home for many living things that help plants grow.

It's important to know that **soil is not the same as dirt**. Soil is a mix of minerals, organic matter, air, water and living organisms. The Soil Science Society of America defines soil as "the unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants." This is the basis of farming and growing food. Soil scientists describe soil as a natural part of the earth's surface that has formed over time through the effects of climate (water, temperature, wind), living organisms, and the shape of the land.

Soil serves as a foundational component of agriculture as well as infrastructure such as roads and buildings. It plays a critical role in hydrological processes by absorbing precipitation and gradually releasing it into groundwater systems. Additionally, soil acts as a natural filter for chemical substances and provides habitat for a diverse community of organisms—including insects, earthworms, fungi and bacteria—that contribute to soil health and nutrient cycling. Organic matter within the soil is essential for carbon sequestration and supports the biological processes that supply nutrients to plants

Understanding Soil Health

These days, there's a lot of talk about "building healthy soils." But what exactly does that mean? The challenge is that there isn't one single, agreed-upon definition of what makes soil "healthy."

For the purposes of this discussion, we'll use the definition provided by the USDA Natural Resources Conservation Service (USDA-NRCS), **"Healthy, fully functioning soil is balanced to provide an environment that sustains and nourishes plants, soil microbes, and beneficial insects."**

For agricultural growers one of the most important points about soil is that healthy soil promotes plant growth, feeds microorganism living in the soil, and creates a home for other organisms such as insects. It's a living system.

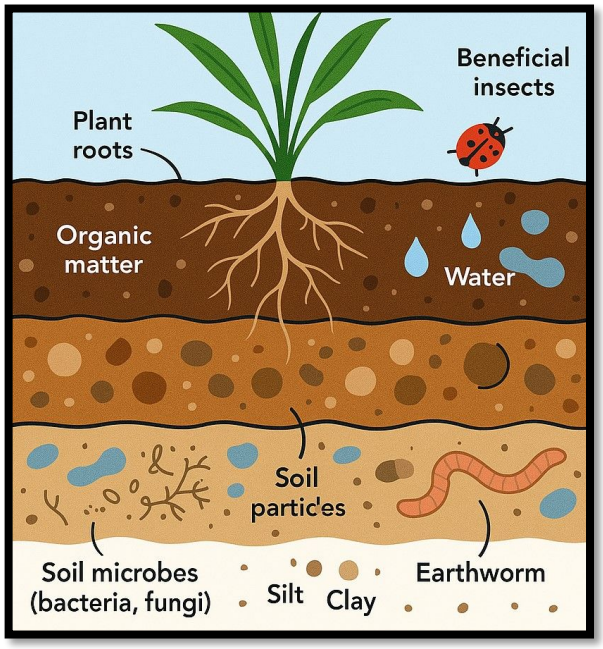


Photo Generated with AI

Soil is much more than dirt—it's a bustling ecosystem, teeming with visible and invisible life. From earthworms to microorganisms such as bacteria and fungi , countless organisms call soil home, relying on it not just for shelter but also for nourishment. In fact, a single teaspoon of healthy soil holds more living organisms than the entire human population. These microorganisms play a critical role in maintaining soil health and balance. When soil supports a rich and diverse biological community, it can better perform life functions like nutrient cycling, water filtration, and plant growth—hallmarks of a truly healthy soil.

Soil Functions

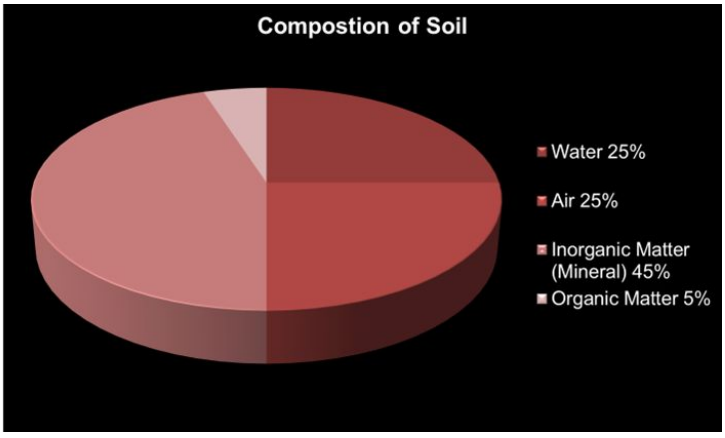
Healthy plant growth depends on what the soil can offer. Healthy soil provides:

- A healthy space where plants can grow well
- Provides microbes a place to live
- Water to transport nutrients and cool plants as plant-water evaporates.
- Air for roots to absorb oxygen and release carbon dioxide
- Nutrients to build plant tissues
- Anchors plants to keep them steady and supports good root growth

Soil Composition

Soil is made of four key parts:

- **Minerals**: Sand, silt, and clay containing essential elements like calcium and magnesium
- **Water**: Holds dissolved nutrients and supplies moisture to plants
- **Air**: Provides oxygen for roots and removes carbon dioxide
- **Organic Matter**: Helps form soil aggregates, improving water flow and air exchange. **Soil organic matter** is all non-mineral solids in soil, arising from biological tissues, byproducts, and wastes living and decomposing.



The ideal soil includes:

- 45% minerals
- 25% water
- 25% air
- 5% amount of organic matter

Soil Formation

Most Michigan soils come from weathered rock. Over time, forces like rain, ice, wind, plants and even microbes break rocks down into tiny particles. Glaciers helped grind and mix these particles into sand, silt, and clay—building blocks of Michigan's mineral soils.

Soil Formation Basics:

Soil formation begins with parent material, such as weathered rock or wind-blown silt known as loess. Over time, this raw material transforms into soil through natural processes—organisms grow and die, precipitation carries away minerals through infiltrating through the soil or runoff, and distinct soil horizons slowly develop. These layers take years to form and reflect the ongoing influence of climate, plant life, and biological activity. In Michigan, where forests dominate the landscape, soils typically have thinner topsoil compared to those found in the deep-rooted grasslands of prairie regions. This difference affects how the soil supports crops and how it should be managed for farming.



Photo Courtesy: Michigan State University

Soil Horizons Overview:

This is more soil science vs improving soil for healthy crops, you said you needed to reduce this, maybe just mention there are horizons or soil layers and the top 2

- **O horizon**: Surface litter and plant debris
- **A horizon**: Dark topsoil rich in organic matter
- **E horizon** (often missing): Leached zone with few nutrients
- **B horizon**: Subsoil where minerals and clays collect
- **C horizon**: Partially weathered parent material
- **R horizon**: Bedrock (deep below in Michigan)

Special Michigan Soils:

Soils form in wet areas and include:

- Peat: Partially decomposed plant matter
- Muck: Fully decomposed organic material

These soils, rich in organic matter, are great for vegetables when drained.

Soil Surveys:

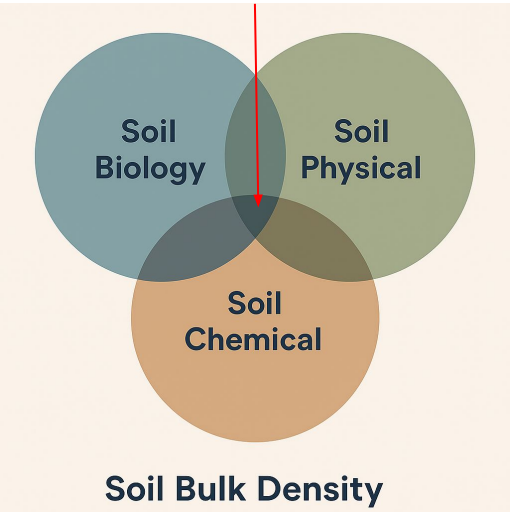
Soils are grouped into series based on traits like texture and slope. The USDA Soil Survey provides maps and descriptions to help farmers understand their land available at websoilsurvey.nrcs.usdaa.gov.

How To Get Started

Soil health can be divided up into 3 soil characteristics:

1. Biological
2. Physical
3. Chemical

Where these three characteristics all intersect is where to find good healthy plant producing soil:



We will explore each of these soil characteristics to better understand how growers can manage their soil to have better production.

Food for thought: **Consider ways to manage soil that improve crops and your profits-matching your farm goals.** What we mean is to not try to produce crops that prefer muck soils such as elderberries or certain root crops in sandy soils.Grow crops that grow well in the soil that you have. Start wisely to end happily.



Photo Credit: https://extension.psu.edu/earthworms

RESOURCES & PARTNERS

Soil Resources

To explore your soil visit the USDA-NRCS Web Soil Survey

https://websoilsurvey.nrcs.usda.gov/app/

"Building Soils for Better Crops". SARE Publication 10

https://www.sare.org/resources/building-soils-for-better-crops/



Photo Credit: https://www.ndsu.edu/soilhealth/?page_id=410

SECTION 1

Soil Physical Properties

Soil's physical traits affect how it behaves and how we can use it. Key properties include:

- Texture
- Structure
- Temperature
- Density
- Porosity
- Moisture
- Organic Matter
- Color



Heavily Tilled Soil

Soil Physical Properties

Texture: What Soil Is Made Of

Soil texture is the mix of sand, silt, and clay particles. These vary in size:

Particle Type	Size Range
Sand	2–0.05 mm
Silt	0.05–0.002 mm
Clay	< 0.002 mm

Most soils contain a mix of these particles. Texture influences drainage, water holding and nutrient availability. A loam, for example, balances sand, silt, and clay—making it great for farming.

The textural triangle is a tool used to identify a soil's texture class, based on lab-tested percentages of sand, silt, and clay.

Feel and Function

You can feel texture by hand:

- **Sand** feels gritty
- **Silt** is smooth and silky
- **Clay** is sticky when wet

Texture shapes:

- How water moves and drains
- How roots grow
- How nutrients are held
- How soil warms or cools

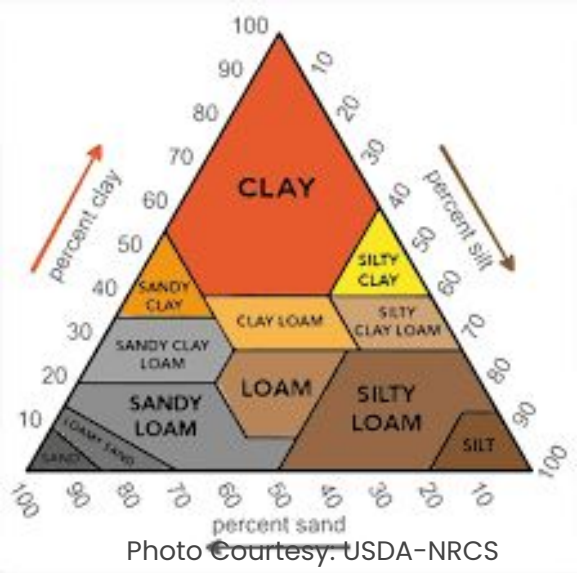


Photo Courtesy: USDA-NRCS

Structure: How Soil Holds Together

Soil structure is how particles stick together to form aggregates. These affect root growth, water movement, nutrient availability and soil health.

Structure forms through:

- Microbial activity That add gums and glues
- Wetting and drying cycles
- Plant roots, decaying plant materials and burrowing organisms

Good structure means good tilth—easy for roots to grow and water to flow. While texture can't be changed, structure can be improved through healthy practices like organic matter addition and reduced compaction.

Soil Physical Properties

How Soil Structure Gets Damaged—and How to Protect It

Healthy soil has good aggregation: large pores for air and drainage, small pores for water and nutrients. But compaction, over-tillage (shattering), and organic matter loss are common threats.

1. Compaction

- Happens when soil is worked while wet (e.g., driven or walked on), causing aggregates to press together.
- Reduces pore space, restricts air, water and root movement.
- High bulk density = poor plant growth.
- Compaction can reach subsoil depths and become long-lasting or permanent.

2. Shattering (Over-Tillage)
   - Excessive use of rototillers, disks or cultivators pulverizes aggregates, forming weak, unstable soil.
   - Dry or sandy soils are especially vulnerable.
   - Rain or irrigation then causes crusting, which blocks air/water movement and plant emergence.
   - Surface runoff may lead to erosion and water pollution.
3. Organic Matter Depletion
   - Frequent tillage accelerates breakdown of organic matter.
   - Without regular replenishment (e.g., compost, crop residues), aggregation declines.
   - Depleted soils become more prone to compaction and breakdown.

Bottom Line

Tillage is a tool—not a fix-all. Use it wisely. Understand your soil's condition, choose the right equipment, and prioritize soil health with minimal disturbance and regular organic inputs.

Soil Physical Properties

Improving Soil Health: Practical Steps for Farmers

One of the most effective ways to build healthy soil is by adding organic matter. This strengthens soil structure, supports good water movement, and boosts fertility. It also feeds microbes that create sticky substances (microbial gums) which bind soil particles together into stable aggregates.

What to Add:

- Crop residues and compost help build structure and retain nutrients.
- Cover crops (also known as green manure) protect soil during off-seasons and add biomass when turned under.

Using Manure Safely

- Raw manure should not be applied less than 120 days before harvest to avoid contamination risks (e.g., E. coli).
- Composted manure (120 days) is safer and provides excellent nutrients.
- Always follow food safety guidelines, especially for crops eaten raw.

Earthworms: Nature's Engineers

Earthworms improve soil health by:

- Mixing organic matter with minerals fertilizer
- Creating channels for water and air
- Supporting microbial activity
- A healthy worm population is often a sign of a thriving soil ecosystem.

Some growers try to "fix" sandy soils by adding clay—or clay soils by adding sand. While small, balanced mixes (e.g., 5–10% clay into sand) can work, too much clay turns soil into concrete. A better, more reliable solution? Add organic matter.

What about adding soil amendments

Before adding any soil amendments, a wise grower will take a soil test. Add soil amendments based on recommendations of the soil test. Adding amendments without knowing what the soil needs can cause more harm than good, reducing yields and crop quality. For example, gypsum (calcium sulfate) may help improve structure in high-sodium soils by replacing sodium with calcium, allowing clays to form aggregates again. Most soils in Michigan and Eastern U.S. do not have high sodium. Gypsum is usually unnecessary unless soil is impacted by salt, like near roads or sidewalks. Unlike lime, gypsum is pH-neutral, so it won't raise soil pH. but it can also interact with other nutrients causing a soil nutrient imbalance.

Bulk Density and Soil Weight

Bulk density measures the dry weight of soil in a given volume. It reflects how tightly soil particles are packed and influences root growth, water movement, and aeration.

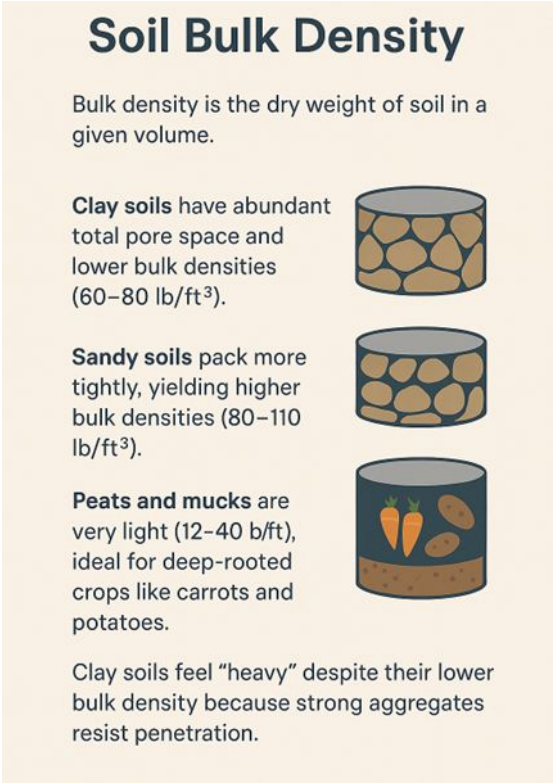


Photo Generated with AI

- Clay soils have abundant total pore space and lower bulk densities (60–80 lb/ft³).
- Sandy soils pack more tightly, yielding higher bulk densities (80–110 lb/ft³).
- Peats and mucks are very light (12–40 lb/ft³), ideal for deep-rooted crops like carrots and potatoes.
- Clay soils feel "heavy" despite their lower bulk density because strong aggregates resist penetration of water and roots.

Key Takeaways for Beginning Farmers

- Aim for a balance of macropores (for drainage and roots) and micropores (for water storage).
- Improve structure with organic matter rather than altering texture.
- Monitor soil moisture to time irrigation and avoid water stress.
- Maintain healthy porosity to reduce compaction, erosion and poor aeration.

Soil Temperature

Appropriate soil temperature is crucial for seed germination, root growth and nutrient uptake. It's influenced by:

- Heat Input: Solar radiation warms the surface; darker soils (clay) absorb more heat than lighter soils (sand).
- Water Content: Wet soils heat and cool more slowly due to water's high heat capacity.

Management Practices:

- Mulching: Insulates soil, evens out temperature swings, and conserves moisture. • Remove mulch in spring so soil can warm quickly for planting.
- Tillage: Brings cool subsurface soil to the surface for faster warming. • Drying the tilled layer and removing residues increases solar heating.
- Frost Protection : Avoid cultivating, hoeing, or adding mulch when frost is expected—these actions reduce soil's ability to warm the air around the plants and can worsen frost damage.

Soil Color

Soil color reveals organic matter content, surface heating rates, and natural drainage:

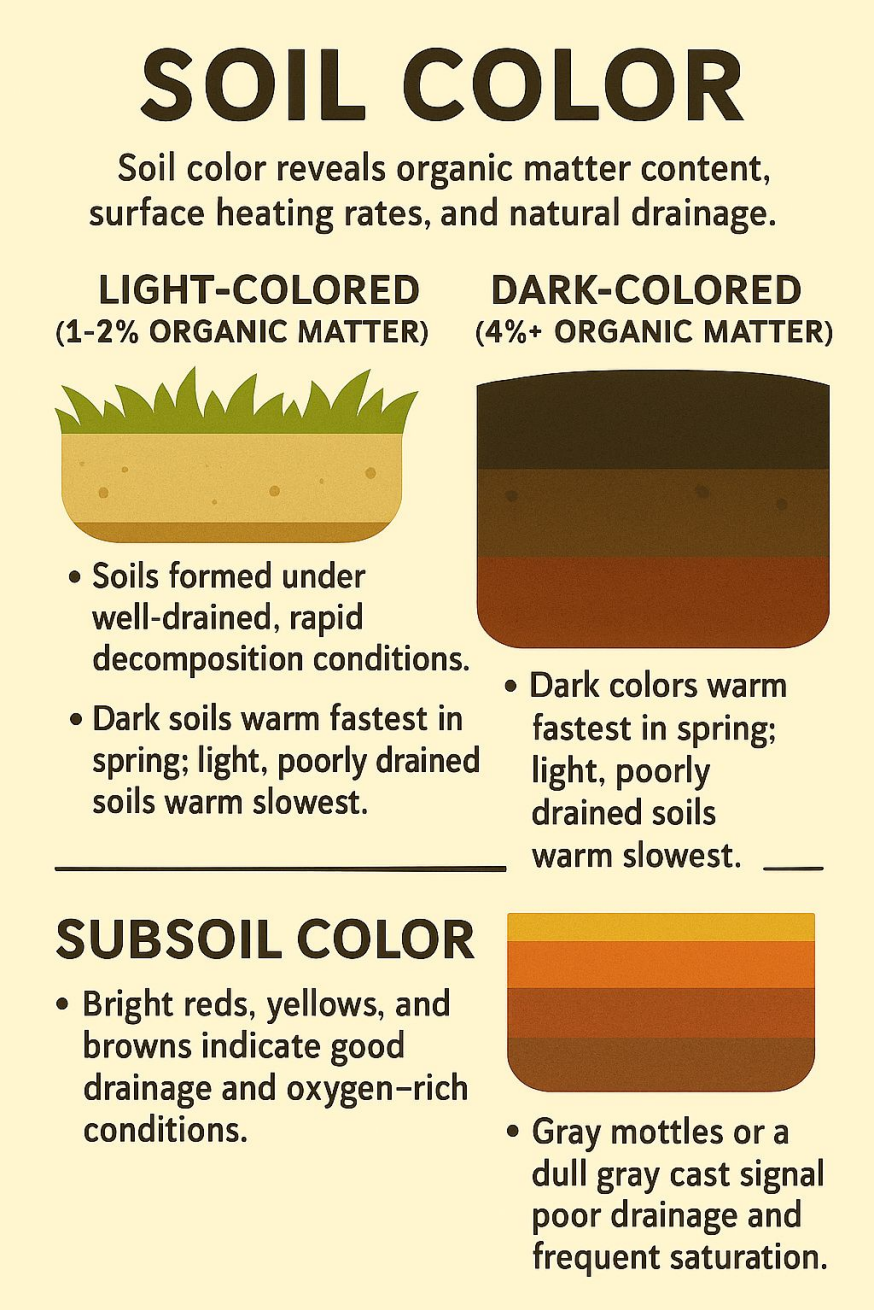


Photo Generated with AI

Summary

1. Test soil before applying soil amendments like gypsum or lime
2. Know Your Soil Profile : A loamy topsoil over gravel at 2–3 feet can be drier than it appears.
3. Building Structure: Adding organic matter improves soil aggregation—but avoid nutrient overload with excessive manure.
4. Manage Compaction: Fine textured, wet soils are most vulnerable. If you must till to break compaction layer do it when the soil is dry.
5. Control Erosion: Maintain ground cover on slopes or adopt no-till methods. Use residues and mulches to shield soil from rain and wind.
6. Frost Warning: Hold off on any soil disturbance when frost is predicted to avoid increasing risk of damage.

Tips and Tricks to Minimize Physical Degradation of soil

Compaction:

1. Ball Test: Squeeze soil into a ball. If it crumbles, it's dry enough to till.
2. Avoid: Heavy machinery on wet soils and repeated use of plows/disks at the same depth.
3. Tip: Use tillage only when necessary—and only when soils are dry enough to break compacted zones.

Shattering

Tip: Rotate tillage tools and depths. Reduce tillage intensity. Protect soil with cover crops and organic amendments.

Organic Matter Depletion

Tip: Add organic matter as needed and limit disturbance. Healthy microbial activity builds resilient soil structure.

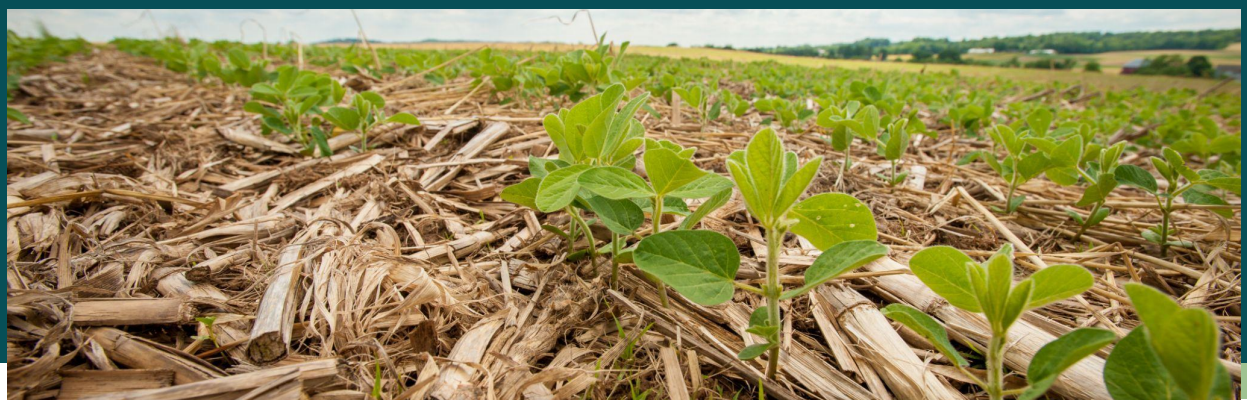


Photo Credit: https://covercropimages.sare.org/p113337072

RESOURCES & PARTNERS

Soil Resources

To explore your soil visit the USDA-NRCS Websoil Survey

https://websoilsurvey.nrcs.usda.gov/app/

"Building Soils for Better Crops". SARE Publication 10

https://www.sare.org/resources/building-soils-for-better-crops/

Soil Health Nexus Toolbox

https://soilhealthnexus.org/resources/soil-properties/soil-physical-properties/

"Beginning Farmer Curriculum- Soil Health"

https://www.beginningfarmercurriculum.org/soil-health



Photo Credit: https://www.flickr.com/photos/ricephotos/2194112283

SECTION 2

Soil Chemical Properties

Understanding Plant Nutrients for Beginners

To grow strong and healthy plants, 16 essential nutrients are needed. Think of these nutrients as the building blocks that help plants develop properly.

Each capital letter in the chart below stands for one of these nutrients:

H-Hydrogen	C-Carbon
O-Oxygen	B-Boron
P-Phosphorus	Mg-Magnesium
K- Potassium	Cl-Chlorine
N-Nitrogen	Mn-Manganese
S-Sulfur	Mo-Molybdenum
Ca-Calcium	Cu-Copper
I-Iron	Zn-Zinc

Where Do These Nutrients Come From?

- Hydrogen from the water in the soil.
- Oxygen comes from air, plants absorb it through their stomata and lenticels.
- Carbon comes from carbon dioxide in the air, absorbed through the plants stomata.
- Nitrogen mainly comes from decaying organic matter in the soil, but legumes can also enrich the soil by fixing nitrogen. This process, called nitrogen fixation, occurs when bacteria living on their roots convert nitrogen from the air into a form the plants can use.
- The other nutrients are found in soil minerals and organic matter.

Macronutrients vs. Micronutrients

Plants need macronutrients in larger amounts and micronutrients in smaller amounts—but both are equally important!

Macronutrients	Micronutrients
Nitrogen (N)	Boron (B)
Phosphorus (P)	Chloride (Cl)
Potassuyn (K)	Manganese (Mn)
Magnesium (Mg)	Nickel (Ni)
Calcium (Ca)	Copper (Cu)
Sulfur (S)	Iron (Fe)
	Molybdenum (Mo)
	Zinc (Zn)

Next Steps

Understanding how each nutrient helps plants and how to manage them in your soil is key to successful farming. Up next: a closer look at the six macronutrients—what they do, how they behave, and how to make sure your plants get enough of them.

Macronutrients: What Plants Need Most

Plants need six main nutrients in large amounts to grow well. These are called **macronutrients**, and each one helps with different parts of plant growth.

🌱 Macronutrient	🌿 Role in Plant Growth	🧪 Common Sources	⚠️ Deficiency Symptoms	🚫 Excess Symptoms
Nitrogen (N)	Leaf and stem growth; chlorophyll production	Compost, manure, ammonium nitrate, urea	Yellowing of older leaves; stunted growth	Weak, fast growth; fewer fruits
Phosphorus (P)	Root development; flower formation; energy transfer	Bone meal, rock phosphate, superphosphate	Small size; purple/brown leaves; leaf drop	Blocks zinc and iron uptake
Potassium (K)	Fruit development; water regulation; disease resistance	Potash, wood ash, potassium sulfate	Weak stems; leaf edge browning; fewer fruits	Blocks magnesium and calcium uptake
Magnesium (Mg)	Chlorophyll formation; seed production	Epsom salts, dolomitic lime	Yellowing between veins on older leaves	Blocks calcium absorption
Calcium (Ca)	Cell wall strength; root and leaf development	Lime, gypsum, calcium nitrate	Curled leaves; weak stems; blossom-end rot	Raises soil pH; blocks other nutrients
Sulfur (S)	Protein and amino acid formation	Gypsum, elemental sulfur, sulfate fertilizers	Pale leaves; slow growth	Soil acidification (rare)

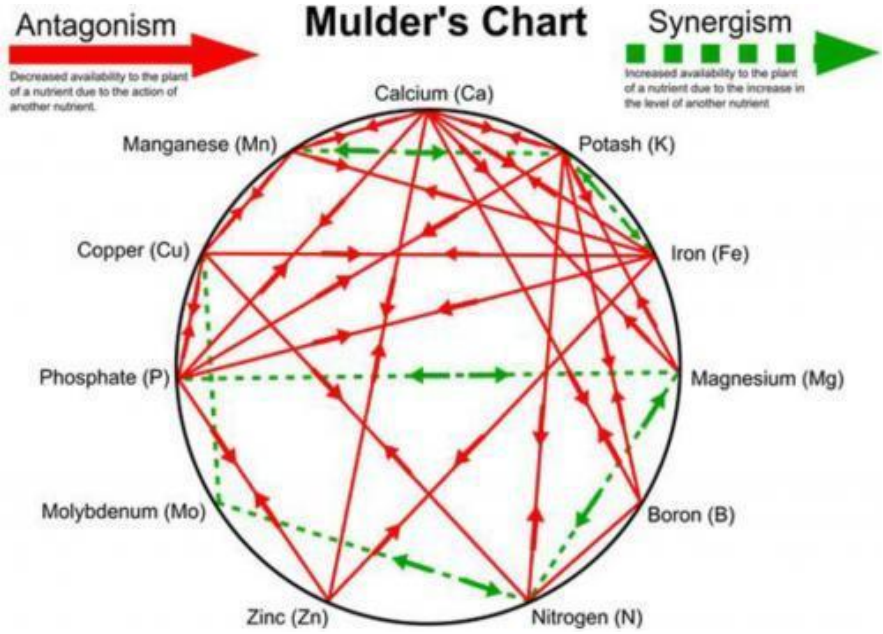
Why Nutrient Balance Matters in Soil
It's not just about having the right nutrients in your soil—it's about having the right *balance* of them. Plants need both **macronutrients** (like nitrogen and potassium) and **micronutrients** (like iron and zinc). If there's too much or too little of any one, it can cause problems.
Some nutrients help each other work better—this is called a **synergistic** relationship. Others can get in each other's way—this is called an **antagonistic** relationship, see Mulder's Chart.

Example:

- **Potassium** helps plants use **iron** and **manganese**.
- But if there's *too much potassium*, it can block the plant from using **magnesium**, **boron**, **nitrogen**, **phosphorus**, and **calcium**—even if those nutrients are in the soil!
- Sometimes, a nutrient like **calcium** can:
- **Outcompete** other nutrients like potassium and magnesium at the root level.
- **Change the soil's pH**, making nutrients like iron and boron harder for plants to absorb.

Another way to look at it is imagine nutrients as the wooden slats of a bucket. If one slat is shorter than the others, the bucket can't hold much water. That's how nutrient imbalance works—plants can only grow as well as the *least available* nutrient allows.





Photos Courtesy of Ron Goldy, MSUE retired

Understanding Soil pH

Soil pH tells us how acidic or alkaline the soil is. It's based on the amount of hydrogen ions (H^+) in the soil. More hydrogen ions mean the soil is more acidic; fewer mean it's more alkaline.
Soil pH is measured on a scale from 0 to 14:

- 7 is neutral (like pure water).
- Below 7 is acidic.
- Above 7 is alkaline.

Each step down the scale (for example, from 7 to 6) means the soil is 10 times more acidic. So, soil with a pH of 4 is 1,000 times more acidic than neutral water at 7!

Why does this matter? Because soil pH affects:

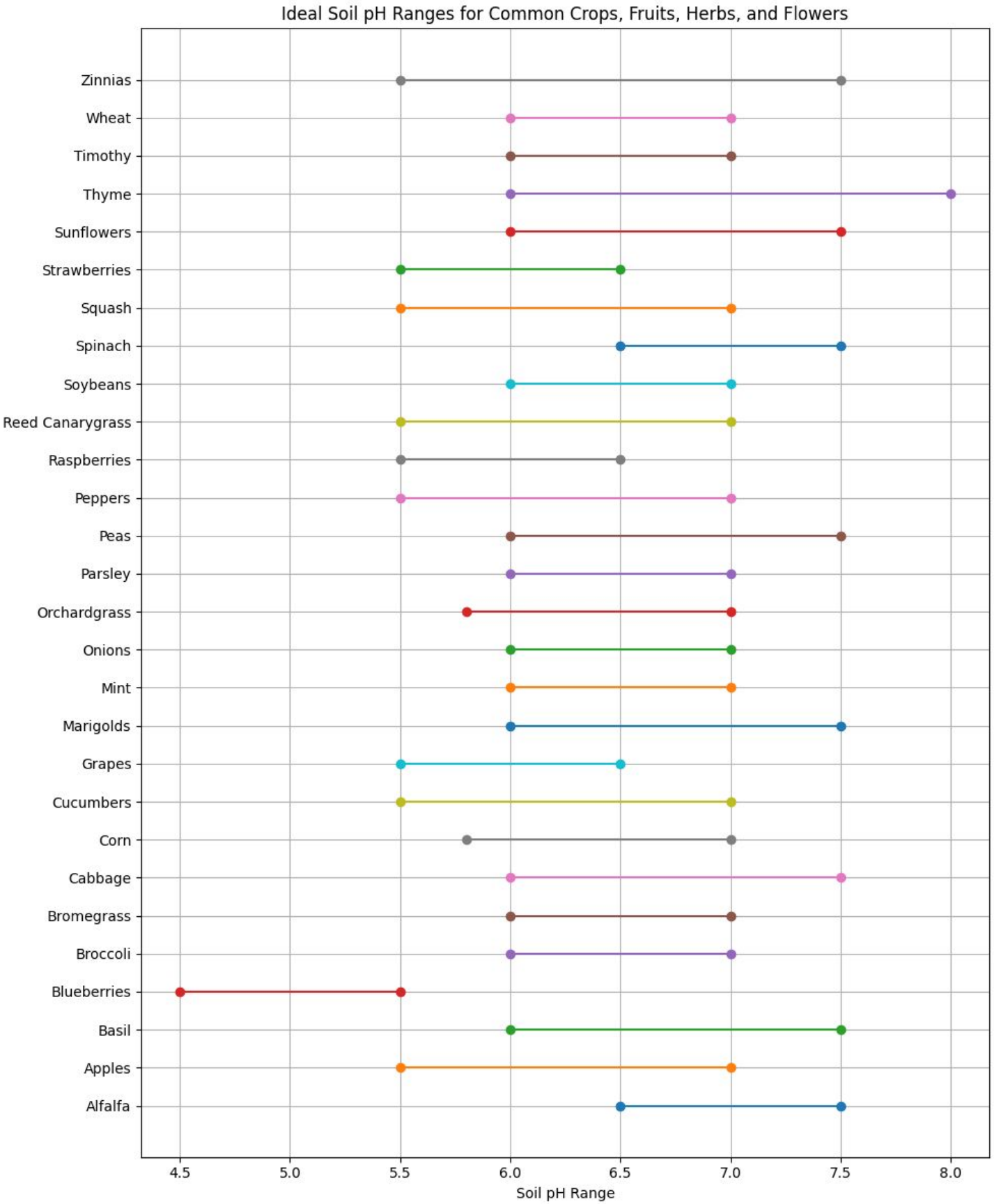
- How well plants can absorb nutrients.
- The activity of beneficial soil organisms.
- The availability of harmful elements like aluminum and manganese- when pH is too low.

Most crops grow best in soil with a pH between 6.0 and 7.0. But some plants prefer different conditions, see chart on next page.

Also, the type of soil matters. Mineral, courser textured soils such as sand, should be kept around pH 6.5. If the pH in mineral soils drops below 5.5, harmful elements like manganese and aluminum can build up and hurt your plants. Organic (muck) soils, fine textured or soils high in organic matter, do better at a more acidic pH , ~5.2.

Lime and Soil pH
Adding lime (a soil amendment) can raise the pH and reduce acidity. Some crops need more lime than others. Lime adjusts the soil pH to be in line with the crops needs. Refer to the soil test to identify the pH then adjust to the plant needs. Most plants do well at a pH between 6.0 and 7.0 but others may need a different pH. Taking regular soil test, every 3-4 years or if you make any management changes, and following agronomic recommendations is critical to maintain soil pH for plant production.

For more information on pH and nutrients effects on plant growth please check out the Nutrient Management Chapter.


Ideal Soil pH Ranges for Common Crops, Fruits, Herbs, and Flowers
Zinnias
Wheat
Timothy
Thyme
Sunflowers
Strawberries
Squash
Spinach
Soybeans
Reed Canarygrass
Raspberries
Peppers
Peas
Parsley
Orchardgrass
Onions
Mint
Marigolds
Grapes
Cucumbers
Corn
Cabbage
Bromegrass
Broccoli
Blueberries
Basil
Apples
Alfalfa
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
Soil pH Range

Primary Considerations

Soil testing is essential to ensure that you have a health crop. Before you send in a soil sample make sure that the lab uses sound scientific protocols for their testing. Certification through Agricultural Laboratory Proficiency (ALP) Program or the Agricultural Laboratory Testing Association (ALTA) is recommended for soil chemistry. There are soil health testing labs however clear standards have not been set for these tests so it is important that you understand how to take a sample and how to read the results. The lab you choose will give you guidance on sample taking and reading your results.

Process for Getting Started



How to take a soil sample:

1. Map your field avoiding field margins and any unfarmed. The field size should not exceed 40 acres. Split field if there are different crops, management or a distinct soil type or topography.
2. Collect soil cores at a depth of 6” in a zig zag pattern throughout the field . You can use a spade or a soil probe. You will take 20 samples in total.
3. Place these samples in a bucket. Mix the soil samples in the bucket—pour the sample onto a newspaper to dry overnight.
4. Fill a sample bag with the dried sample. Be sure to send the amount of soil requested by the lab.
5. Complete any forms for the laboratory and pack the sample. Follow the lab’s instructions to send the sample and forms





Photo Credit: Jeff Vanuga, USDA-NRCS

RESOURCES & PARTNERS

Soil Resources

To explore your soil visit the USDA-NRCS Websoil Survey

https://websoilsurvey.nrcs.usda.gov/app/

"Building Soils for Better Crops". SARE Publication 10

https://www.sare.org/resources/building-soils-for-better-crops/

Soil Health Nexus Toolbox

https://soilhealthnexus.org/resources/soil-properties/soil-chemical-properties/

MSU Extension Resources on Soil Sampling

https://www.canr.msu.edu/resources/the-anatomy-of-a-soil-test-report

https://www.canr.msu.edu/soil_health/uploads/files/Soil%20Sampling%20Guide.pdf



SECTION 3

Soil Biological Properties

Soil Microbiology: Healthy soils are rich with soil microbes. These organisms help break down organic matter, release nutrients for plant use, and create soil that supports life. Soil texture types, (see physical soil properties chapter), impact the amount and type of microorganisms in the soil. Course texture sandy soils cannot sustain as many microorganism as finer texture clay soils. That is why courser sandy soils often have a lower organic matter than finer clay soils. That does not mean that the courser texture soils are not as healthy, it just means that there are different populations of soil microbes. Growers should not make soil health determinations based solely on the biological properties, but they should look at the physical and chemical properties also.

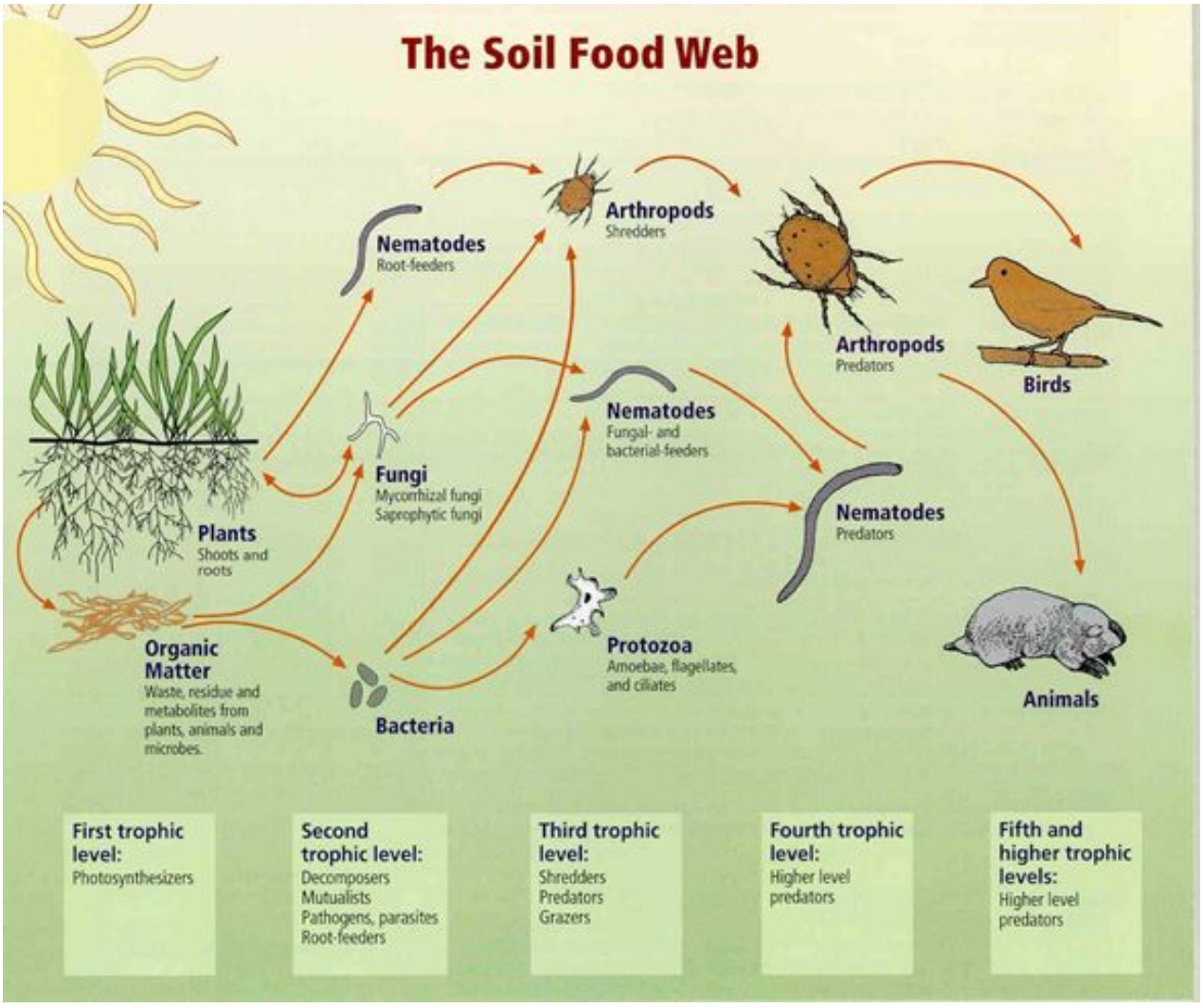
Microorganisms like bacteria, fungi, protozoa and nematodes are key to nutrient cycling-helping nutrients to become available to plants by soil microbes feeding. Bacteria decompose organic material and recycle plant nutrients, while fungi also help break down dead matter. Of course, some soil microbes can cause plant diseases. Protozoa and nematodes feed on microbes and release nutrients in plant-available forms. Mycorrhizae are beneficial fungi that team up with plant roots to improve water and nutrient uptake.

Larger soil animals, including invertebrates like earthworms, centipedes, and insects, tunnel through soil, mix materials, and feed on organic matter. Even vertebrates such as moles and mice influence soil through burrowing and feeding.

Together, this underground ecosystem keeps the soil alive and productive—an essential foundation for any successful farm.

Soil Biological Properties

Soil life—mammals, plants, insects, microbes—must stay balanced to grow healthy crops. Tillage or flooding of the soil boosts bacteria and reduces fungi. Acidic soils (low pH) favor fungi and lower bacteria. Knowing these shifts helps farmers manage soil for plant



Graphic Courtesy: USDA-NRCS

Soil Biological Properties

Organic Matter

Soil organic matter (SOM) is a key biological indicator of soil health. It's measured as a percentage of the soil's weight, typically ranging from less than 1% in sandy soils to over 5% in loamy soils. While SOM may seem like a small part of the soil, its impact is significant. SOM directly influences the soil's physical and chemical properties, making it an essential concept farmers to understand and manage.

Types of Soil Organic Matter

Scientists classify SOM into three categories: **Living**, **Labile** and **Stable**. Soil types play an important role in the amount of each in a field. The balance between these types offers valuable insight into the overall health and function of the soil.

Type of Organic Matter	Description	Key Components	Dominant Environment	Farm Management Impact
Living	Includes living organisms and decomposing materials	Bacteria, fungi, earthworms, plant roots, compost, manure	Bacteria dominate in tilled fields; fungi in forest soils	Microbial communities and residue composition reflect tillage and other practices
Labile	Recently decomposed residues; fuels microbial life	Plant, animal, fungal residues; glomalin which are like soil glues that make up soil aggregation	Found in active soil layers. Highest impact on soil health for production agriculture	Sensitive to change; reduced inputs lower levels; cover crops, compost, and reduced tillage help rebuild it
Stable	Long-lasting, well-decomposed material called Humus	Humus	Present in all soils, especially those with long-term organic inputs. Provides stable environment for microorganisms.	Less affected by short-term changes; long-term practices influence its presence

Primary Considerations

Building and maintaining soil biology is an important part of ensuring that you have good, healthy soil to support growing crops.

Process To Get Started

Roof: Chemical Properties
- Nutrient Levels
- pH Balance

The roof regulates what comes in. Feeding the soil and plants. A balanced roof ensures nutrients are available and not lost to leaching or toxicity.



Walls: Physical Properties
Soil Texture (Clay, Sand, Silt),
Structure,
Porosity, and Water Holding Capacity
These Determine:
- How air and water move
- How roots grow
- How plants anchor

Foundation: Biological Properties
- Microorganisms
- Earthworms
- Fungi
- Other living organisms

These lifeforms build and support the soil structure. Breaking down organic matter, nutrient cycling, and create stability for everything above.

Primary Considerations

Measuring soil health and any changes that your fields are going through is a good way to determine if the practices on your farm are improving or destroying soil health. There are several labs that test for soil health but yet there are no standard testing protocols for soil health. Labs use different protocols and testing measures to determine the health of your soil. Also, unlike chemical testing, a soil health test should be conducted in one spot in the field and only represents that one spot under the soil conditions on the day of testing. To that end, many prefer in-field sampling to measure changes in soil health.

Process for Getting Started



How to take an infield soil health test.

1. Download a copy of the Michigan Soil Health Card
2. Conduct the in-field assessment as instructed.
3. Repeat annually and try to sample the same time each year.



Photo Credit: https://www.ndsu.edu/soilhealth/?page_id=420

RESOURCES & PARTNERS

Soil Resources

To explore your soil visit the USDA-NRCS Websoil Survey

https://websoilsurvey.nrcs.usda.gov/app/

"Building Soils for Better Crops". SARE Publication 10

https://www.sare.org/resources/building-soils-for-better-crops/

Soil Health Nexus Toolbox

https://soilhealthnexus.org/resources/soil-properties/soil-chemical-properties/

MSU Extension Resources on Soil Sampling

https://www.canr.msu.edu/resources/the-anatomy-of-a-soil-test-report

https://www.canr.msu.edu/soil_health/uploads/files/Soil%20Sampling%20Guide.pdf



Photo Credit: Steve Culman

RESOURCES & PARTNERS

MSU Extension Resources on Soil Sampling

Michigan Soil Health Progress Report

https://www.canr.msu.edu/resources/michigan-soil-health-progress-report

Curriculum for Beginning Farmers-Testing your Soil

https://www.beginningfarmercurriculum.org/soil-health

WATER MANAGEMENT

Agricultural Drainage



AUTHORS & INSTITUTIONS

Ehsan Ghane, Associate Professor and Extension Specialist, Biosystems & Agricultural Engineering Department, Michigan State University

SECTIONS

Section 1: Drainage

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Efficient water management is crucial for agricultural productivity and environmental sustainability. This guide provides beginner farmers with a structured approach to understanding and implementing effective drainage systems, focusing on both surface and subsurface methods.

How to Get Started

Starting with drainage planning involves assessing your field's specific conditions, including soil type, topography, and existing water issues. Utilize the DrainTool and consult resources provided by Michigan State University's Biosystems & Agricultural Engineering Department to design a system tailored to your needs.





SECTION 1

DRAINAGE

Primary Considerations

Soil Type:

Determines how fast water can move through the soil and affects the choice of narrower or wider drain spacing.

- Soil with more clay content requires narrower drain spacing than a soil with more sand content.





Topography:

Influences water flow and drainage design.

- Water moves from high spots to low spots of the field. Drainage design should be in such a way to intercept the water movement downslope.



Crop Type:

Different crops have varying tolerance levels to water saturation.

- Field crops (corn, soybean, wheat) have a greater tolerance to water saturation than truck crops (fruits and vegetables). Thus, truck crops need narrower drain spacing than field crops to provide suitable crop growth conditions.



Environmental Impact:

Consider potential nutrient loss and implement practices to mitigate negative effects.

- Consider designing the system with a conservation-focused approach, allowing for future retrofitting with conservation drainage practices such as controlled drainage.

Process for Getting Started

Field Assessment:

Evaluate soil conditions, drainage classification, water issues, and crop requirements.

- Soils classified as somewhat poorly drained, poorly drained, or very poorly drained typically require subsurface drainage. In some cases, even moderately well-drained soils may benefit from drainage.
- Low yield areas on a yield map may indicate water stress in the crop, suggesting a potential need for subsurface drainage.

Design Selection:

Choose if you need subsurface drainage based on assessment.

Tool Utilization:

Use the DrainTool to get the optimum drain spacing.

Implementation:

Install the chosen drainage design with proper materials and techniques.

Maintenance:

Regularly check system performance.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



DRAINAGE

COMMON QUESTIONS

01 What is the difference between surface and subsurface drainage?

Surface drainage removes excess water from the soil surface, while subsurface drainage (tile drainage) removes water from the soil profile. In some cases, surface drainage complements subsurface drainage when the subsurface system alone cannot remove water quickly enough.

02 How does drainage affect crop yield?

Proper drainage can increase corn yields by 20% to 80%, with a payback period ranging from 2 to 6 years. Use the DrainTool to estimate the site-specific payback period based on your local conditions.

03 What are the environmental concerns associated with drainage?

Drainage can lead to nutrient loss, particularly nitrate and phosphorus, which may cause algae blooms in surface water.

04 How do I determine the appropriate drain spacing?

Use the DrainTool to calculate the optimal spacing that maximizes economic return on investment.

05 What maintenance is required for drainage systems?

Regular inspection for clogging, sediment buildup, and system performance is essential to ensure long-term effectiveness. For more information about maintenance requirement, see “Inadequate maintenance” heading on this webpage:
https://www.canr.msu.edu/drainage/conventional-drainage/drainage-under-performance/index



RESOURCES & PARTNERS

Necessary Resources

www.canr.msu.edu/drainage

- **Tools:**

  Includes DrainTool, Drain Sedimentation Tool, and others.

- **Educational Publications:**

  Access bulletins and guides on drainage practices.

- **Workshops and Field Days:**

  Participate in events like the Drainage Workshop for hands-on learning.

Partners

- **Michigan State University Extension:**

  Provides research-based information and support.

- **USDA NRCS:**

  Offers technical and financial assistance for conservation practices.

- **Local Conservation Districts:**

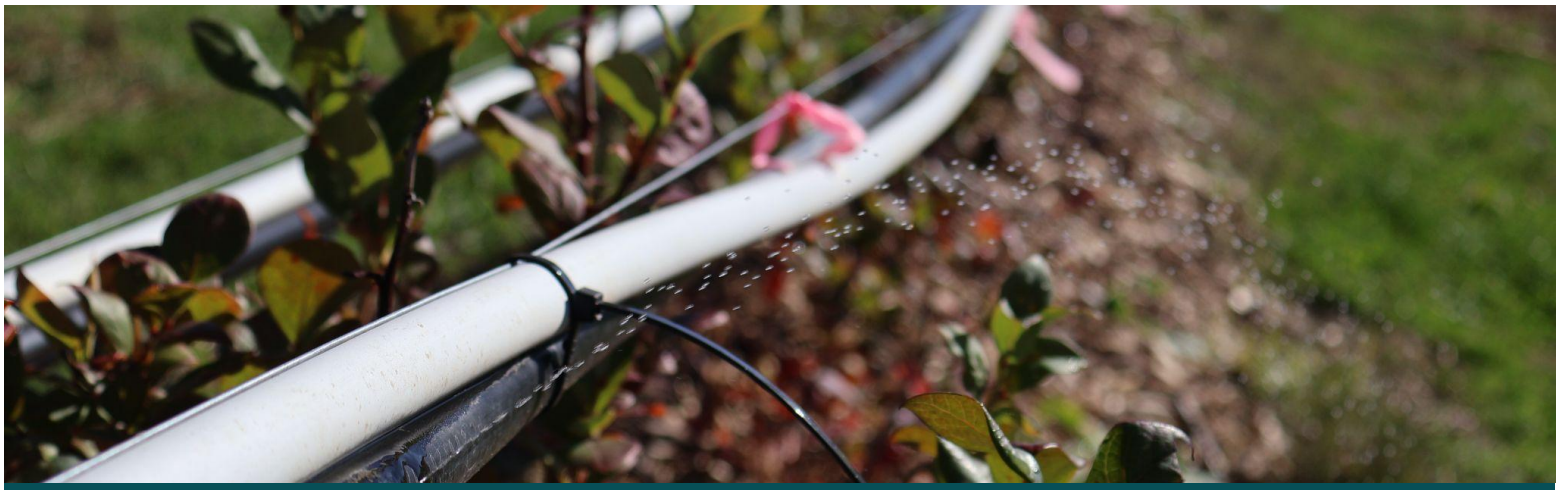
  Assist with planning and implementing drainage conservation solutions.

- **Michigan Land Improvement Contractors of America:**

  For hiring a drainage contractor.

WATER MANAGEMENT

Drip Irrigation



AUTHORS & INSTITUTIONS

Benjamin Phillips, Vegetable Specialist, Michigan State University Extension
Brenden Kelley, Water Use Efficiency and Irrigation Educator, Michigan state University Extension

SECTIONS

Section 1: Designing your drip irrigation system

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Irrigation

Drip tape is the way to go for most vegetable systems. They require lower pressure compared to overhead irrigation, delivering it right to the root zone of the crop. There are higher quality tapes and tubes for potential re-use and for burying as subsoil-irrigation. For growing in pots or grow-bags, irrigation lines are often paired with small drippers that are staked into pots or hang above and drip into them.

Drip-tape users usually do not need high pressure, and can settle for anything from a 10 gallon per minute (gpm) to 120 gpm pump, depending on how much area and how far it is from your pump. Sizing a pump to your system is best left to a good sales person.



Fertilizing through Drip Irrigation



Chemigation is the practice of adding a chemical to irrigation water in order to fertilize, clean the irrigation system or adjust the characteristics of the water or soil. Fertigation is the most common form of chemigation, focusing on adding a chemical to increase fertility.

Unless you plan to mix an entire irrigation application by hand, chemigation and fertigation require a fertilizer injector. This piece of equipment allows you to feed a chemical or fertilizer into the irrigation line at a selected rate. Popular brands of injectors are Mazzei, Dosatron, and Chemilizer. The Mazzei injector is less adjustable than the positive displacement pumps. Of the positive displacement pumps, the Chemilizer is probably the best at handling acid-injection, as it keeps its gaskets and seals away from the injected material. Dosatrons are the most common positive displacement pump, and there are many generics as well. For very small scale uses, the Hozon injector is an option, but they do not work well with drip tape.

Any form of chemigation, including fertigation, requires a backflow prevention device to stop irrigation water from being siphoned back down the well where added chemicals can contaminate groundwater supplies. Be sure to use the appropriate model of backflow prevention device if you decide to chemigate.



Berry Hill Irrigation, Drip Depot, and Trickl-Eez are three supply companies specializing in the irrigation needs of vegetable growers.



SECTION 1

DESIGNING YOUR DRIP IRRIGATION SYSTEM

Properly setting up an irrigation system is a science that requires a bit of math and creativity. The following considerations have examples to help you get started with drip irrigation.

Primary Considerations

- Determine what area you need to irrigate, in terms of total area and the number of linear feet. For example, you have 10 beds, 50 ft long, 5 ft apart center-to-center, and they are 30 inches across. The total area is ((10 beds x 5 ft apart) x 50 ft long) = 2,500 sq. ft. With a 30 inch bed top you probably only need one line of drip tape, placed along the center of the bed. So that is 10 rows x 50 ft long x 1 = 500 linear feet.

- Determine how much water you will need to deliver. One inch of water per week is recommended as a general rule. That is 27,154 gallons of water over one acre (43,560 sq. ft). For 2,500 sq. ft. that is 27,154 gal x (2,500 sq. ft. / 43,560 sq. ft.) = 1,558 gallons of water per week.



- The last step determines how much time to run your system, and it is highly dependent on your system's parameters. We have 500 linear feet with one line per bed. A common drip tape output is 0.45 gallons per minute (gpm) per 100 linear feet. We would have 5 sets of 100 linear feet (500 / 100). Our total system output is 5 * 0.45 gpm = 2.25 gpm. If we need 1,558 gallons of water then it would take 692 minutes of run time, or 11.5 hours. Over the course of seven days, that would be 1.6 hours per day (11.5 / 7).



Process for Getting Started

- Define your market goals and how much area you might need to plant at a time. Does the size or shape of that area change throughout the year, or move to areas farther from a water source? This would help determine what amount of drip tape and pump support you would need.
- Talk to a mentor.
- Research equipment online.
- Visit a trade show or dealership.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.





DRIP IRRIGATION

COMMON QUESTIONS

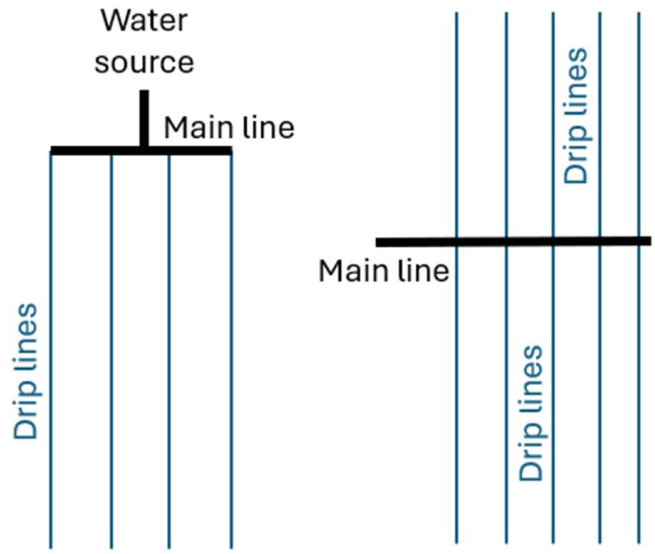
01 What kind of drip tape is available, and what is best for me?

- Drip tape is sold according to its thickness, spacing between emitters, and its flow rate in gallons per minute (GPH) per every 100 ft or gallons per hour (GPH). For multi-year use a thicker walled tape would be better. For a densely planted crop a tighter emitter spacing is better. For sandier soils, a higher flow rate is better.
- **Common flow rates** include 0.25 GPH, 0.3 GPH, and 0.5 GPH
- **Common emitter spacings** include 6”, 12”, 18”, 24”, 30” and 36”
- Drip tape is not the same as drip tubing, tubing is ridged and circular in cross section, while drip tape flattens when not pressurized and is more supple. Drip tape is cheaper per unit of distance, but less durable.
- Drip emitters are available in pressure compensated and uncompensated forms. Pressure compensated line usually costs more, but helps to ensure a more even application, especially on long lines.

02 I hate plumbing, so tell me how much plumbing is involved.

You will need a **filter**, a **backflow preventer**, a **pressure reducer** (down to 15 PSI), and **valving** to turn on zones or individual rows. You might also need to create a valved bypass if you choose to fertilize through the tape. There are kits available that make this easy! You will want extra drip tape unions, and unions, elbows and tees for your header line.

Unless you are using a relatively short single line of drip irrigation, you will need some kind of manifold, header or mainline to dispense water to individual lines. Larger diameter tubing carries water more efficiently since there is less loss of flow due to friction. Using larger diameter pipes or tubing can help cover areas that are farther from the water source. Below are some examples of common layouts for drip irrigation.



If you are irrigating a large area, multiple crops, or have a limited water supply compared to your water demand, breaking fields into zones that are controlled by valves can help. Since each zone is only a fraction of the total area, the flow required to operate a single zone is also only a fraction of the total.

By rotating between different zones a much larger total area can be irrigated with the same water source.

03 Are there risks to fertilizing through drip tape?

The most important risk is contaminating groundwater through backflow into your well. That is why it is essential to plumb in a check valve or backflow preventer. Another risk is that some fertilizers can plug emitters in the drip tape. Be sure to use solution-based fertilizers that dissolve, or dilute suspended fertilizers like fish emulsion enough so that they can get through. An additional filter may be necessary, and you should flush the lines after all fertilizer has been passed through to ensure that emitters are cleared.

Even with filters, drip emitters can become clogged with deposits created from chemical interaction between the fertilizer and components of your water. Much like household faucets and showerheads, things that are naturally in well water can precipitate out and restrict flow. Issues with calcium and iron are common in Michigan wells.

Biofilms and Algee can also present issues with clogging emitters and are often exacerbated in the presence of fertilizers.

04 What are the benefits of applying fertilizers through drip irrigation?

Drip irrigation applies irrigation, and fertilizer in the case of fertigation, directly to the soil surface above the root zone. This reduces losses and side effects from applying fertilizer using a sprayer or broadcasting method since vegetation and other surfaces are not being covered with the fertilizer solution.

The application rate of drip irrigation is consistent and relatively slow. This makes it easier to control the application of fertilizer and keep the applied nutrients in the root zone.

05 Can drip tape be unclogged if the emitters are plugged or restricted?

Button emitters (AKA punch in emitters) can sometimes be disassembled and manually cleaned with brushes, soap and water.

There are some solutions, including organic solutions, that may be added to the irrigation water to help unclog emitters. See attached link for chemical treatment of clogged emitters in the resources section below.

Flushing the water through the drip lines shortly after the fertilizer application can help to prevent clogging

Opening the end caps on the lines and flushing the lines may help in the case of coarse particles that are not already lodged in the emitters.

In some cases, replacement of the drip tape / tubing may be easier and more cost effective. This is a more favorable option the older your system is.

06 Is drip tape recyclable?



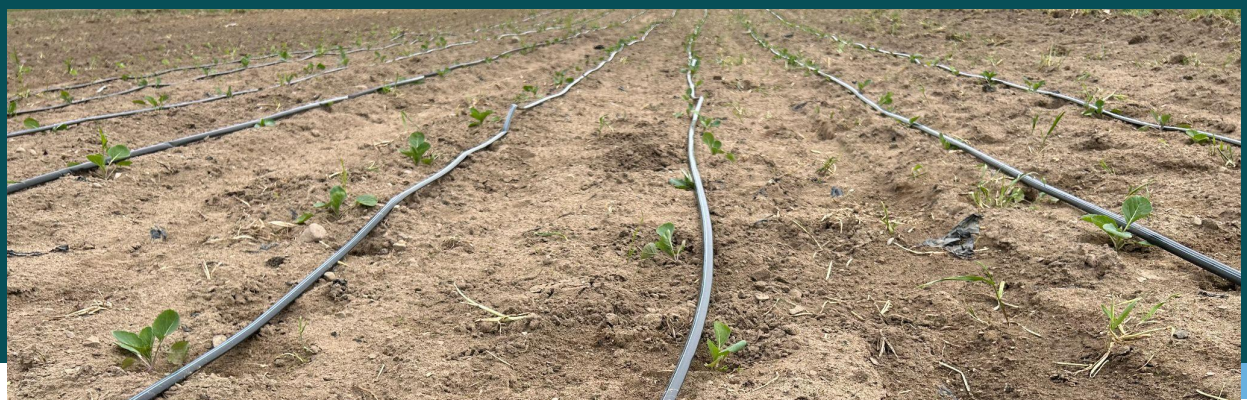
It is not commonly accepted by recyclers, and is usually thrown away as trash. Biodegradable drip tapes have not made it to market yet.

Avoid burning, burying, or dumping discarded drip irrigation materials. Disposal via landfill is currently the most responsible option.

07 How do I lay or install drip tape?



Drip tape comes in rolls. One way to do it by hand is to anchor the loose end and pull the roll to the end of your row, unspooling the tape as you walk. Another way is to put a broom handle through the roll, and support the roll on the rungs of a step ladder at the end of the row and while you pull the loose end out. There are machines that can inject drip tape through a tube at various depths under the soil as well, and others that lay drip tape at the same time as plastic film mulches.



RESOURCES & PARTNERS

Necessary Resources

- **Resource for chemical treatment of clogged emitters:** https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/666031/maintaining-a-drip-irrigation-system-for-perennial-horticulture.pdf

Partners

- Irrigation dealerships
- Conservation Districts

WATER MANAGEMENT

Center Pivot Irrigation



AUTHORS & INSTITUTIONS

Angie Gradiz, Agriculture Water use Efficiency Educator, Michigan State University Extension
Lyndon Kelley, Water Management and Irrigation Educator, MSU Extension
Younsuk Dong, Irrigation Specialist, Biosystems and Agricultural Engineering, Michigan State University

SECTIONS

Section 1: Irrigation Planning

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

One of the most important aspects of crop production is ensuring that water is available when crops need it most. Since rainfall can be unpredictable, planning for irrigation is a smart step to help protect your crops and yields. In Michigan, center pivot irrigation systems are the most commonly used method, covering about 76% of all irrigated farmland, according to the **USDA NASS, 2022 Census of Agriculture**.

Center pivots are popular because they can water large areas efficiently and require less labor and setup than systems like drip irrigation. When properly managed, they can reach 75–85% water application efficiency. This type of system works especially well for field crops and some vegetables, such as potatoes and carrots. In addition to watering crops, center pivots can also be used for fertigation, a method of applying fertilizer through the irrigation water.



How to Get Started

Center pivot irrigation is a significant investment that requires careful planning to avoid costly mistakes in the future. Before moving forward, start by asking yourself: What is my primary reason for irrigating? Ideally, the goal should be to increase net farm income compared to dryland production, especially if you're growing high-value specialty crops.

A well-planned irrigation system can provide a good return on investment, but only if it's designed and managed correctly. If you're confident in your decision to irrigate, the next step is to carefully consider several key factors in the planning process.





SECTION 1

IRRIGATION PLANNING

A reliable water supply is the foundation of any irrigation system. It's essential to consider irrigation water requirements, identify available water sources, and understand regulations and registration processes before getting started.

Primary Considerations

Irrigation Water Requirements

The first question to ask is: **Is there enough water available to meet your crop's irrigation needs?** In Michigan, peak crop water use driven by evapotranspiration can range from 0.25 to 0.30 inches per day for several days during the summer. To meet a 0.25-inch/day water demand, your system must deliver at least 5 gallons per minute per acre (gpm/acre). For 0.30-inch/day, you'll need around 7 gpm/acre. Reaching this level of supply often requires continuous pumping 24 hours a day, 7 days a week during drought conditions.



Ground Water Availability:

Irrigation cannot be profitable without a reliable and adequate water source. Nearby large volume irrigation, municipal or industrial wells are an excellent source of water availability. Local well drillers with experience in high-capacity wells are also valuable resources, they can provide insight into groundwater depth, yield, and quality in your specific location. Additionally, Michigan offers tools that can help evaluate potential water withdrawal sites before investing in a system.

Surface Water Availability:

If you're considering using surface water for irrigation, it's important to ask: Is there a reliable and sufficient supply available during peak demand? In Michigan, maximum irrigation needs typically occur in late July through early August, which is also when surface water levels are at their lowest. To avoid running short, you should evaluate stream or pond flow during the summer before you plan to begin irrigating. In most areas, you are not allowed to reduce stream flow to the point where it harms neighboring users or the environment. For example, water from state drainage ditches may already be allocated or insufficient during dry periods. Additionally, be aware of food safety concerns. Surface water sources can be vulnerable to contamination, especially when used for irrigating or cooling vegetables or other food crops.

Water Quality:

Both groundwater and surface water should be tested for water chemistry to ensure they are suitable for agricultural use. It's also important to consider food safety, especially when using surface water, which is more prone to contamination and poses risks when applied to vegetables or other food crops for irrigation or cooling. Additionally, water high in minerals can lead to clogging in drip and sprinkler systems, reducing their efficiency and lifespan.



Water Rights and Regulation:

Before installing an irrigation system, it's essential to understand your rights and responsibilities regarding water use in your state. For example, Michigan is a riparian rights state when it comes to surface water, meaning only property owners whose land directly borders a water body have the legal right to use that water. However, groundwater (well water) may be transferred between properties, depending on specific conditions. To learn more about Michigan water rights, refer to the Water Rights in Michigan guide produced by Michigan State University (MSU) Extension.

Water Registration:

Irrigation is almost always classified as a large-volume water use, defined as any system with the capacity to pump more than 70 gallons per minute. In both Indiana and Michigan, new large-volume water uses must be registered before installation. In Michigan, users must complete the ***Water Withdrawal Assessment Tool (WWAT)*** to evaluate whether the proposed water use may negatively affect nearby streams, lakes, or other water users.

Based on the results:

- You may be approved to register your system online, or
- You may be required to request a site-specific review by the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

If a site-specific review is needed, EGLE may:

- Approve the withdrawal and allow registration, or
- Initiate a process involving other large-volume users in the watershed to negotiate reduced water use and create space for the new withdrawal.

For detailed guidance, refer to MSU Extension's Irrigation Fact Sheet #7, which outlines the Michigan water use registration process step by step.

Process for Getting Started

Map Your Irrigation Ideas:

Start your planning by obtaining an aerial map of all the land you're considering for irrigation. You can use online tools such as Google Maps, or request a paper map from your local USDA Farm Service Agency. Use it to locate large fields near water sources, identify obstacles like woodlots or fences, and note drainage issues that could impact system layout and cost. In addition, consider that slopes can affect runoff, water pressure and system efficiency.



Sharing Irrigation Equipment:

Irrigation systems are often scale-dependent, meaning their cost-effectiveness improves with larger operations. One way to reduce individual costs is to share irrigation expenses by jointly investing in equipment with a neighbor.



Power Sources:

Identify available power sources for your irrigation system. The most cost-effective option is a three-phase power line located within half a mile of your water source. Liquid fuel storage near wells or surface water can pose environmental risks and result in higher equipment, maintenance, and fuel costs, making engine power a secondary option in most cases.

Get Multiple Bids:

Leverage the expertise of irrigation professionals by consulting with at least two irrigation sales/design specialists. They often have access to advanced mapping and planning software, and their experience in system design far exceeds that of most producers. Compare the designs they propose based on cost per irrigated acre for a typical year of irrigation. This will help balance your investment in equipment, energy costs, and labor requirements, ensuring you make the most informed decision. Another cost-saving option is to consider purchasing used equipment, which can significantly reduce initial expenses. With some repairs or maintenance, used systems can often be restored to function properly.

Irrigation Economics:

When considering irrigation, focus on increasing your average net income per acre after accounting for the additional costs associated with the system. To achieve positive results, you'll need to accurately estimate both fixed and variable costs. A helpful tool for evaluating the economic feasibility of your investment is the **Irrigation Capital Model - Spreadsheet to determine capital investment**.

Crop Rotation and Tillage Preferences:

Irrigation has proven most economically beneficial for commercial corn and alfalfa among traditional crops. However, small grains and soybeans tend to yield the lowest returns on irrigation investment. Adding irrigation often leads to changes in crop rotations, but it's important to note that irrigated fields tend to have a lower proportion of no-till systems compared to non-irrigated fields, possibly due to the excess corn residue produced on irrigated land.





Specialty/Vegetable Crop Options:

In Michigan, contracted specialty crops, such as vegetables and hybrid seed corn, dominate irrigated lands. These crops benefit from sandy soils, which reduce risks related to early planting, provide fewer delays due to rain, and lower the chances of flooding damage. The ability to alleviate drought stress also attracts high-value crops to the region. However, these favorable conditions are not available everywhere in Michigan and Indiana. Be sure to research the realistic and feasible options for your specific operation before investing in specialty crops.

Plan Ahead:

Installing an irrigation system requires careful planning well before the growing season begins. Take the time to evaluate your crop needs, choose the right system, and account for potential delivery and installation timelines, which can take several months. Fall delivery is often ideal, allowing for assembly during the off-season so the system is ready by spring. Rushing the process can lead to costly mistakes and delays.

Align Your Farming and Family Goals with Irrigation Plans:

Before committing to irrigation, consider how it aligns with both your farming and personal goals. Irrigation requires significant summer labor and can cut into personal time, especially during the busy growing season. The need for skilled irrigation labor is another consideration, as qualified help can be hard to find. Misjudging your available labor and management time could lead to operational challenges.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



PIVOT IRRIGATION

COMMON QUESTIONS

01 What type of irrigation system is best for my farm?

The best type of irrigation system for your farm depends on several factors, including:

- **Crop type:** Sprinkler systems like center pivots are commonly used for field crops such as corn, soybeans, and wheat due to their wide coverage and lower maintenance. Drip irrigation provides precise water application and reduces disease risk, making it ideal for vegetables and high-value crops.
- **Soil type:** Sandy soils require more frequent irrigation, so systems that allow for controlled, frequent applications, such as drip or sprinkler systems are preferred.

- **Water source and availability:** If water supply is limited, drip irrigation is the most efficient choice. For farms with more available water, sprinkler systems can be more feasible and easier to manage.
- **Topography:** Flat fields can accommodate most irrigation types, but sloped or uneven terrain often benefits from drip irrigation to minimize runoff and erosion.
- **Initial Cost:** Sprinkler systems typically have lower upfront costs. Drip systems require a higher initial investment and maintenance but offer long-term water savings.
- **Energy source:** The type of energy used for pumping whether electric or diesel along with associated costs and maintenance, should be carefully considered. Center pivots often require higher horsepower and may need a three-phase power supply. In contrast, drip systems operate at lower pressure and generally have lower energy requirements.
- **Labor:** Consider how much time and effort you're able to invest. Drip systems may require more frequent maintenance, while center pivots can be more automated.

02 How do I know if I have enough water available to irrigate?

Before investing in irrigation, it's important to assess whether you have enough water available for agricultural use. Michigan offers online water resources to help estimate large-volume water availability in the area. Well log databases are available in **Michigan's Scanned Water Well Record Retrieval System**. These databases provide information on well depth, location, and capacity. However, most records are for domestic wells, which typically require lower capacity and may not reflect the true potential of local aquifers for high-volume agricultural withdrawals. These wells are not always drilled into the most productive part of the aquifer or to the depths typically needed for irrigation.

When planning for irrigation, consider that most systems in Michigan are designed to apply at least 1 inch of water every four days; a rate that supports peak crop water demands during the growing season. To achieve this, you'll need a pumping capacity of about 5 gallons per minute (gpm) per acre. For example, a field of 100 acres would typically require a 500-gpm water supply to meet irrigation needs efficiently. For more information, refer to **adequate water supply is the heart of an irrigation system** article.

03 How much does it cost to install and operate an irrigation system?

The cost of installing and operating an irrigation system can vary significantly because each system is highly customizable. Several key factors influence the total cost, including:

- Field size, which determines the size and coverage of the system
- Terrain, as uneven land may require additional preparation or grading
- Sprinkler type, since spray patterns and features vary in efficiency and cost
- End gun inclusion, which adds coverage but also cost
- Control panel features, ranging from basic timers to fully remote, automated systems

Each of these components can be tailored to meet specific farm needs and budgets. To help estimate operating costs, there are tools and examples available. For instance, a **40-acre center pivot cost example** outlines a typical setup scenario and **Analyzing the costs of energy for irrigation in Michigan**.

04 What tools or technologies can help me schedule irrigation?

There are various tools available to help with irrigation scheduling from simple methods like checking the crop water use and rainfall to more advanced technologies like soil moisture sensors and mobile apps. The right choice will depend on your time, budget, and management style. MSU Extension's fact sheet "**Irrigation Scheduling Tools**" provides an overview of available options. Additionally, many irrigation companies offer apps and sensors that can integrate directly with your system.



RESOURCES & PARTNERS

Necessary Resources

- Michigan Water Withdrawal Assessment Tool
- Michigan Registration for New Agricultural Withdrawals
- Estimating Annual Irrigation Costs
- **Spreadsheet to determine capital investment**
- Efficient Irrigation Management with Center Pivot Systems

Partners

- Conservation Districts
- Irrigation dealerships
- Michigan Department of Agriculture and Rural Development
- USDA-NRCS
- Michiana Irrigation Association

Chapter:

Business Planning



AUTHORS & INSTITUTIONS

Katie Brandt, MSU Extension, MSU Organic Farmer Training Program

Jamie Rahrig, MSU Center for Regional Food Systems, Product Center

SECTIONS

Section 1: Writing a Business Plan

Section 2: Common Questions

Section 3: From Business Plan to Reality

Section 4: Resources & Partners

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



BUSINESS PLANNING

INTRODUCTION

A business plan is a document that explains a business's goals and action steps to achieve those goals. It is a living document that requires continuous review and updates to ensure the business remains on track with its goals. A business plan is a critical tool to launch a business as well as prepare for investment or financing.

Use the information in this resource to develop a business plan of your own.

What is included in this guide -

1. Introduction
2. How to Get Started
3. Section 1: Writing a Business Plan
    a. Executive Summary
    b. Overview and History
    c. Market Analysis
    d. Marketing Plan
    e. Operations
    f. Financial Statements
4. Section 2: Common Questions
5. Section 3: From Business Plan to Reality

*"A business plan is a way to **narrate your numbers**: how you will grow and sell farm goods and manage a business."* Sarah Longstreth, Good Stead Farm

How To Get Started

Primary Considerations

Establish your business values, vision, and mission statement

Values

Thinking about your farm as a business is a new concept for many farmers. Considering what values you hold can provide you with your north star to guide your business as you launch, grow and scale.

Values in business are what you believe in and how you operate your farm. Consider what is important to you as you build your farm business. Are you passionate about feeding your neighbors or getting healthy food into your local schools? Ask yourself what you believe in and write down what you value to help you plan for the future.

Vision Statement

Having a vision statement can help drive your business's success. Your vision should be used to set long term goals for your farm. It is a broad reaching goal - where you want your farm to be in 5, 10, or 50 years. Find an example of a vision statement for a farm below:

> At Midwest Acres, we envision a vibrant, health-driven food landscape rooted in the rich agricultural heritage of the Midwest. Our farm strives to be a beacon of regenerative practices, community resilience, and regional pride—where healthy, sustainably grown foods nourish both people and place.

Mission Statement

A mission statement is where you demonstrate your purpose. It highlights the reason you farm - why and how you farm. A mission statement will give you the clear goals for decision making. Find an example of a mission statement for a farm below.

> *At Midwest Acres our mission is to cultivate healthy, sustainably grown foods that nourish our community and respect the earth. We are committed to fostering a deeper connection between people and the sources of their nourishment.*



Mission Statement worksheet from SARE Building a Sustainable Business book:

Worksheet 3.2 Creating My Business Mission Statement

Use the questions below to begin sketching a brief mission statement that communicates your values, management philosophy, and future vision. Remember to have each one of your planning team members complete this Worksheet. Then share your statements, discuss your similarities and differences, and draft a final mission statement. Going through this process as a team will generate more ideas and will result in a common mission statement that every one of your planning team members support. Try to limit your response to each of the questions so that, once combined, your mission statement does not exceed five to six sentences. Remember, write in the present tense and keep it positive.

I would like our business to be known for the following in the future:

TASK 3

The internal and external purpose of my business is to:

Our business mission statement will communicate to:

Based on your answers above, write internal and external mission statements that communicate your business' purpose and the qualities for which you would like your business to be known:

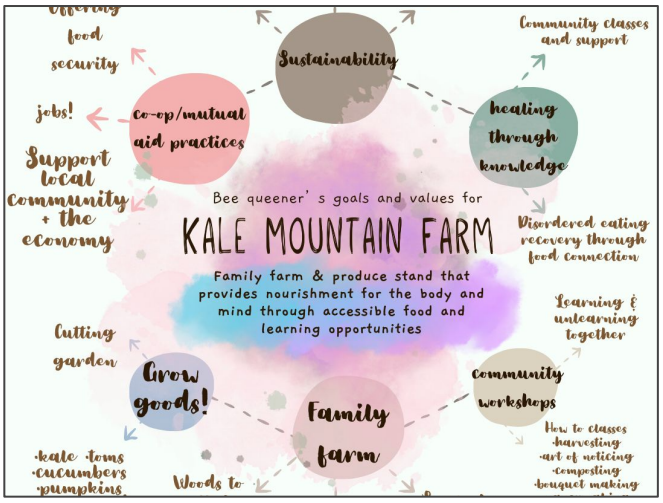
Internal mission:

External mission:

Centering Values in your farm goals and mission statement

It can be a real inspiration to be reminded WHY you're farming. Take time to make a list and think through how to live up to each of your values as a central part of your farm venture.

Example: If your three central values are *Family, Health and Sustainability*, you'll want to post that somewhere that you'll see it regularly. When asked to make a new commitment, you can check in: Does this align with my values or will it prevent me from spending time with my family?



An example of Values & Goals that could be proudly posted as a reminder to keep you on track with your farm vision. This was created by Bee Queener as part of the MSU Organic Farmer Training Program.

Goal-setting

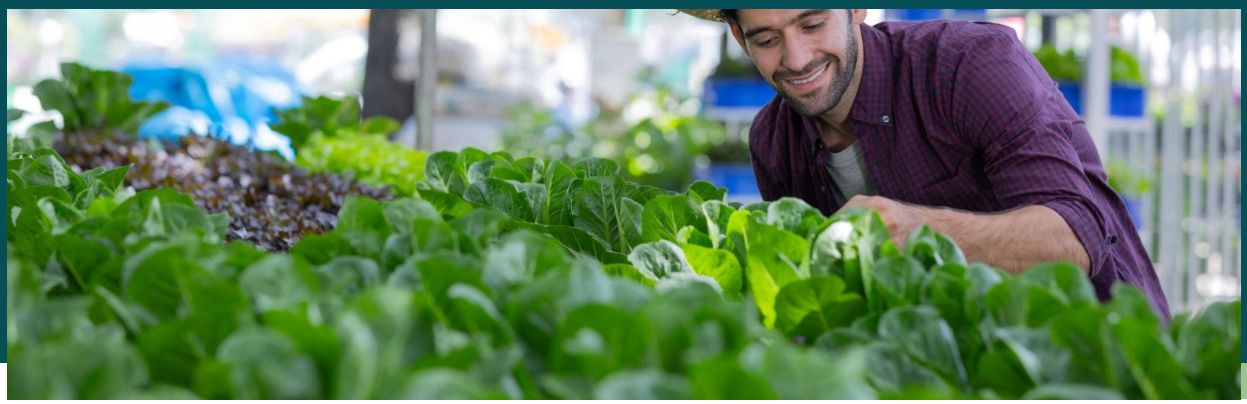
Brainstorm goals for the next few years and the long-term.

Your goals may change over time, so you'll want to return to your goals regularly to see which goals you've met, which need to be changed or removed and which new goals might need to be added. Be patient! Farm goals often take a few years longer than you would expect!

- **Values** - What values do you want to follow and uplift as part of this farm venture?
- **Goals** - Think through your goals for year 1, 2, 3, as well as long-term goals and plans for farm succession. It's also helpful to analyze a few of these goals:
  - Goals Worksheet with SMART goals, HEART goals and a timeline from MSU Organic Farmer Training Program
  - HRM Goal Analysis from MSU Organic Farmer Training Program and an In-depth HRM Goal Analysis by Atina Diffley
- **Mission Statement -** defines a company or non-profit through its purpose (the 'why'), strategy (the 'how'), and guiding values
- **SWOT** - Strengths, Weaknesses, Opportunities and Threats
  - SWOT Analysis Worksheet from SCORE
  - SWOT Worksheet from MSU Organic Farmer Training Program

Goals Worksheet from the MSU Organic Farmer Training Program:

Overall Goals	
Year 1 Goals	
Year 2 Goals	
Year 3 Goals	
Long-Term Goals	
Succession Plan (family transfer, sale, worker purchase or builds sweat equity, etc.)	
What questions would you like to answer to inform your goals?	



SECTION 1

Writing a Farm Business Plan

A business plan helps a farmer tell their business story in a way that can drive important decisions such as marketing strategies or which crop to grow, as well as attract investors.

This chapter of the Beginning Farmer Resource and Decision-Making Guide is one of the resources available as you write your plan. There are many resources available to assist with writing a business plan, including:

- AgPlan from the University of Minnesota
- SARE Building a Sustainable Business book
- MSU Center for Regional Food Systems - Loan Readiness Toolbox for Food and Farm Businesses Business Plan Template
- Organic Farmer Training Program - Farm Plan Template
- Brenda Mae Sharpe of The Foster Patch Farm in Detroit created this Farm Plan Template and shared her completed Farm Plan
- SCORE Business Plan Template for a Startup Business
- Small Business Development Center Traditional business plan format or Lean startup format
- Canva - search "business plan" in the Templates section to choose from many customizable templates
- Artificial Intelligence - Use AI by prompting it to "Write a business plan for a farm in (place) that grows (product mix). Be certain to read and then prompt with new features or edit!

Writing an Executive Summary

The Executive Summary is a brief overview of your business plan. It highlights the various sections of the plan, e.g., ownership, sales data, and purpose of the plan, e,g., a loan request. **This section should be written last,** allowing you to fill in the information you have developed throughout your plan.

The example below is from the MSU Center for Regional Food Systems Loan Readiness Toolbox for Food and Farm Businesses.

Executive Summary: *[1 – 2 pages - this section should be written last. Include the following details in your summary. Delete the table when you are finished.]*

The Product or Service	*The What*
The Leadership	*The Who*
Overall Industry	
Competitors	
Collaborators	
Target Market *(customers)*	
Future Plans *(seeking financing, investment, goal setting)*	

Overview and History

In the overview section of your plan, describe your business story. Share information here about why you started your farm, how it is structured, its location, and history.

Business Structure is important to include the legal structure of your business in your plan. State if you operate as a LImited Licensed Corporation, non-profit, or other type of entity. In this section you can also include ownership structure, mentioning if there are more than one owner or any investors.

Location should be included in the Overview section as well. Describe where you are farming and any key attributes to the region, e.g., proximity to a city where you sell your products. A detailed site map can be very helpful as well.

History provides background information that will help readers understand why the farm business exists. Include a description of the owner(s)' background including work experience, especially any experience working on a farm, sales, marketing, and financing. Add details about key accomplishments and any skill sets that make you an effective business owner.

If you started your business to address a certain issue such as improve health, consider including a link to a website that supports your interest, e.g., the reason you farm is to bring healthy foods to your community. You may choose to include a link to "The Center for Good Food Purchasing" to reinforce your reason for farming.

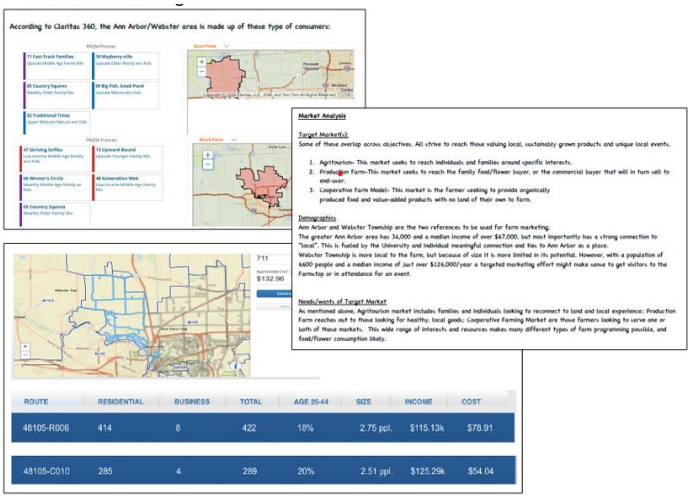


The view from above Green Wagon Farm in Ada, Michigan. Think of your overview as the big picture view of your farm or future farm..

Market Analysis

The Market Analysis section of your plan is especially important to outline how you will learn about your target customer, create a sales strategy, and allocate resources. It usually includes demographic and economic data from the areas where you're selling. But it may focus on commodities price trends if you're a row crop or dairy farmer selling into local, national or global markets. Be sure to commit a good amount of time to develop this section.

Getting to know your markets



Example market research by Carole Caplan at The Farm on Jennings

Doing your own Market Analysis

Listening to your customers is the best market research! Think of feedback as a gift and opportunity, rather than just a complaint or compliment. Now that you know there is a problem, how can you solve it? Now that you know something is appreciated, how can you build on it?

You can use casual conversation, online surveys, a white board with a question, focus groups or dot surveys to get the very best information about your customers and how best to meet their needs.

Online Resources for Market Analysis

- ***US Census:*** ***Quick facts***
- ***2022 Ag Census County Profiles***
- ***USDA Food Access Research Atlas***
- ***USPS Every Door Direct Mail***
- ***Research your competition and potential collaborators***
  - *What is your real competition (Fast food? Busy lives? Farms?)*
  - *www.localharvest.org*
  - *Organic Integrity Database*
  - *Taste the Local Difference*
  - *Visit farmers' markets, co-ops, health food stores, grocers, etc!*
  - *Google!*
- ***Michigan Farm to School Map*** ***(School food incentive program example)***
- *Facebook Audience Insights*

SWOT Analysis = Strengths, Weaknesses, Opportunities and Threats

Strengths and Weaknesses are internal features of your team, skills, experience, location, land, soils, money, resources, tools, practices, infrastructure, products, etc. **Be sure to list a solution for each weakness**. How can you maximize strengths?

Opportunities and Threats are external factors not fully in your control, like markets, customers, trends, economy, regulations, weather, climate, spray drift, competitors, allies, networks, lenders, etc. **How can you minimize or prepare for each threat?**

The example below is the SWOT Analysis Worksheet from SCORE.

SCORE
FOR THE LIFE OF YOUR BUSINESS
www.score.org

SWOT Analysis Worksheet

Fill out the fields below and review with a mentor. This information can help you outline goals and strategies for your business and marketing efforts.

	Strengths	Weaknesses	Opportunities	Threats
Product/ Service Offering				
Brand/ Marketing				
Staff/ HR				
Finance				
Operations/ Management				
Market				

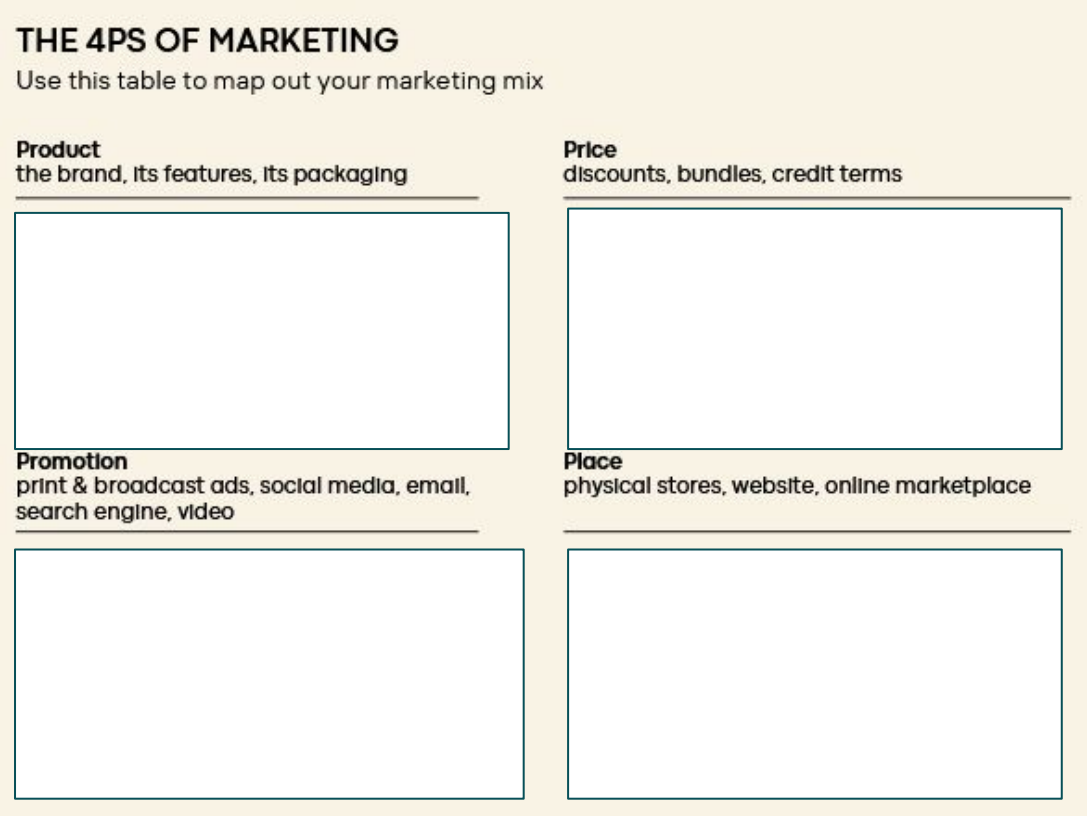
Writing a Marketing Plan

Choose your Market Channels - Will you sell through a farmers market, CSA or on-farm store? Or do you prefer wholesale orders with restaurants, grocers or institutions like schools or hospitals? It's smart to start with one or two market channels in your first season and expand to more channels over time as your capacity grows. The Market Channel Selector Tool can help you decide what markets to start selling into. *Refer to section 1 of the "Marketing and Selling Your Farm Products" chapter for more information and resources for choosing market channels for your farm products.*

Create Marketing Materials - To get the word out about your farm, you'll probably want a logo, website, social media page and some printed materials like signs or pamphlets. You may also want a newsletter, videos or online store. It's good if these can tell a story about you and your farm.

Plan for Promotions - It can be helpful to have a plan for marketing each month of the year. Then you'll start marketing your CSA shares or featured seasonal crops at just the right time.

Remember the 4 P's of Marketing: 1. Product 2. Price 3. Place 4. Promotion. Ref(some lists also include People and Process). The 4 P's below are from Canva.



Operations

The operations section of a farm business plan might include:

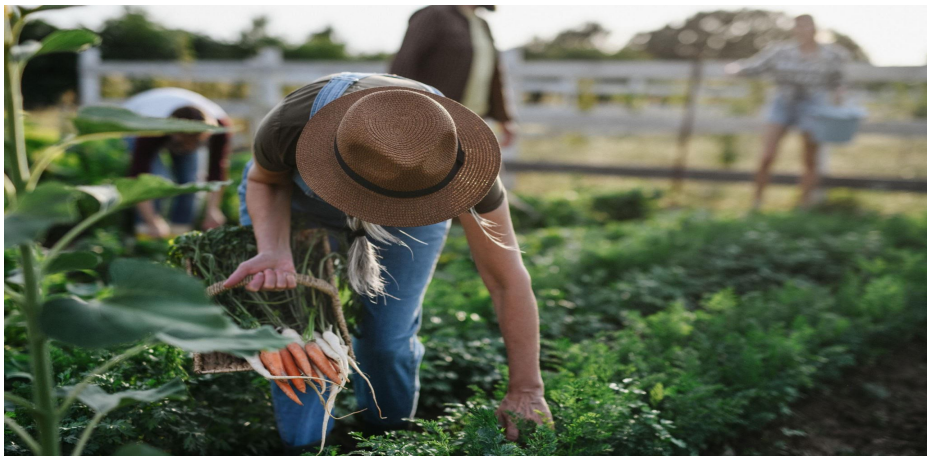
- ❏ Details on the day-to-day management of the farm, e.g., which employee is responsible for each task
- ❏ Inventory management and logistics
- ❏ Site Plan
- ❏ Soil Management Plan
- ❏ Crop and Production Plan
- ❏ Labor Plan

Day-to-Day Operations should be spelled out in your business plan. It helps paint the picture of how your business operates.

Inventory Management and Logistics - Include what inventory you have on-hand, details on your storage capacity, how you fulfill orders, and delivery systems. Mention the equipment you use and land ownership or leases. List barns or other infrastructure, or map them out in your site plan.

Production Plan - Explain in detail how you manage soils, planting, harvesting, seeds, and how you keep track of these details. Explain if you use a computer with Excel spreadsheets or online farm management software. Link to these or attach the Production Plan in the Appendix at the end of your farm business plan.

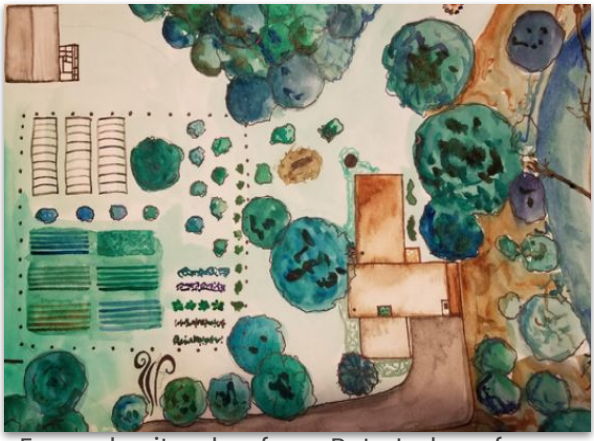
Labor Plan - It is also good to include labor, by listing your employees and their responsibilities. Staffing should also include any consultants you hire, e.g., bookkeepers, marketing firms, etc.



Operations

The operations section of a farm business plan might include:

- ❏ Details on the day-to-day management of the farm, e.g., which employee is responsible for each task
- ❏ Inventory management and logistics
- ❏ Site Plan
- ❏ Soil Management Plan
- ❏ Crop and Production Plan
- ❏ Labor Plan



Example site plan from Pete Imlay of Rebellious Roots Farm

Site Planning involves learning about your land and then deciding where to place infrastructure, fields, water lines, fences, etc. You can sketch the plan, use a google map or use an online tool. Here are some links to help you learn about your site:

- Soil Survey Map
- **Topography Map**
- **Flood Map**
- Wetland Map

Soil Management Plan includes soil test results as well as plans and records for tillage, fertility, cover crops and soil health. You may also include a soil scorecard, soil survey map or observations about your soil.

Crop and Production Planning varies based on farm type. Livestock farms will have health records for each animal or flock, as well as feed and grazing records. Crop farms will have plans and records for seeds, planting, fertilizers, and pest control, to name a few.

Labor Plans are important to ensure the work of the farm is done well. They can include job descriptions, resumes from the farm team and plans or records for work hours, payroll costs, benefits and payroll. It is also important to include labor values and plans to ensure mental and physical health for farm owners.

Operations: Site Plan

Sketch a site plan below or use a soil map, google map, drone photo, drawing, painting or blank sheet of paper and add fields, barns, hoophouses and other infrastructure by hand or digitally.

Operations: Soil Management

Example soil plan from the MSU Organic Farmer Training Program Farm Plan template

Soil Improvement & Fertility Plan	
What are soil challenges at this site (lead contamination, erosion, compaction, etc.)	
What Soil improvement techniques would you use?	
What are some **advantages and drawbacks** of your tillage and soil improvement strategies?	
What cover crops will you grow? When, how and why?	
What is your plan for fertility and amendments?	
Do you need to adjust the pH? How will you do so?	

No-Till Bed Prep Plan –OR– Tillage Plan	
Winter Cover Crop or winter mulch?	
Mow?	
Tillage Step #1	
Tillage Step #2	
Tillage Step #3	
Tillage Step #4	
End of season cover crop?	

Operations: Crop & Production

Example crop planning tools include:

- MSU Upper Peninsula Research and Extension Center Crop Template (shown below)
- Seedtime
- Tend
- **For vegetables,** you may also want to use the newly revised *Northeast Crop Production Manual* and *Northeast Harvest Manual*
- **For row crops**, consider using OGrain Compass, MSU Grain Marketing Plan Template, or the U of Minnesota Grain Marketing Plans
- **For livestock**, try the Oklahoma State University Cattle Marketing Plan or Kansas State University's Livestock Marketing Bulletins
- **For beekeeping**, visit the MSU Beekeeping Resources page or view the Beekeeping section of this guide
- For grains, see the Grain Marketing Plans from Kansas State University
- Excel
- List or map with planting dates
- Notebook with pages by week
- Paper calendar
- Calendar on phone
- Other methods that work for you

The Crop Template below, is an example from the MSU Upper Peninsula Research and Extension Center.

Crop Template - MSU UPREC (Upper Peninsula Research and Extension Center)

s= seed in trays	*Month*	Jan				Feb				March					April					May					June					July				Aug					Sept			Oct				Nov					Dec			
d= direct seed	*Week Date*	5	12	19	26	2	9	16	23	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28
t= transplant	*Week*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
h= harvest	*Weeks to frost date*									12	11	10	9		8	7	6	5	4	3	2	1						12	11	10	9	8	7	6	5	4	3	2	1														
Crop	**Variety**																																																				
Beets	*Red Ace*																											d														h	h	h										
Tomato	*Sungold*																	s					t						h	h	h	h	h	h	h	h																

Operations: Labor

Example labor planning worksheet from SARE Building a Sustainable Business book:

Worksheet 4.21 Human Resources Expense Estimates

Use the space below to estimate and record your human resources input expenses for all family members and hired labor. Make these estimates as realistic as possible—use your research about industry standards and tax rates as well as your own compensation goals.

	Position/Job 1	Position/Job 2	Position/Job 3	Position/Job 4
Job title/description				
Name				
Wages/salary/fees ($/hour)				
Benefits (health care, retirement)				
Taxes				
Insurance (workers compensation)				
Other				
Total labor expenses (a)				
Total hours worked (b)				
Total labor expenses/hour (a) / (b)				

Financial Statements

The financials section of a farm business plan might include:

- ❑ Startup Budget
- ❑ 3-Year Projected Income Statement (aka Profit & Loss)
- ❑ Cash Flow Statement
- ❑ Balance Sheet
- ❑ Enterprise Budgets
- ❑ Resource List
- ❑ Other financial statements as needed, such as loan documents

FAMILY ROOTS FARM

Estimated Start Up Budget Summary

Line Item	Total Estimated Cost
Tillage and Cultivation	$11,155.00
Propagation and Transplant Production	$5,378.20
Infrastructure	$10,500.00
Hoop House and Heating	$5,586.13
Harvest and Pest Management	$2,225.18
Irrigation	$609.00
Marketing and Outreach	$2,800.00
Staffing and Labor	$189,587.00
Operations	$3,750.00
Grand Estimated Total	**$231,590.51**

One Time vs. Recurring Cost
Budget Summary Breakdown

Line Items	One Time Cost Estimate	Recurring Cost Estimate
Tillage and Cultivation	$11,155.00	$0.00
Propagation and Transplant Production	$4,131.20	$1,247.00
Infrastructure	$2,100.00	$8,400.00
Hoop House and Heating	$5,086.13	$500.00
Harvest and Pest Management	$1,601.20	$623.98
Irrigation	$100.00	$509.00
Marketing and Outreach	$0.00	$2,800.00
Staffing and Labor	$0.00	$189,587.00
Operations	$950.00	$2,800.00
Total One Time Cost	**$25,123.53**	**$206,466.98**

Example startup budget from Heidi Bombrisk. Each line links to a detailed expense list by category.

Startup Budget

For new farms or new enterprises, the start-up costs can be high! If your costs exceed your income or savings, you may need to seek more funding and to cut costs. One smart way to reduce expenses in the early years, is to add infrastructure and enterprises over several years.

The startup budget is essential to make certain that you have the needed funds to meet your goals. It can be hard work, but it is much better to see a cash shortfall on a spreadsheet when you still have time to fix the problem.

Here are some useful tools for creating your startup budget:

- MSU Beginning Farmer Scale of Production Matrix
- MSU Organic Farmer Training Program Start-up Budget Template
- Resource Assessment from Michigan Farm Mentors

Income Statements (aka Profit and Loss Statements) add up a year of income, then subtract out annual expenses to show your profit or loss. If you don't have income or expenses yet, you can estimate, look at example Income Statements or wait for more information.

- MSU Income Statement Template
- MSU Center for Regional Food Systems Loan Readiness Toolbox for Food and Farm Businesses
- AgPlan
- Iowa State University Ag Decision Maker Comprehensive Financial Statements

This Projected Income Statement from SARE Building a Sustainable Business lets you compare 3 strategies with different income and expenses:

Worksheet 4.33 Long-Range Projected Income Statement

Use the space below to record average income and expenses (variable and fixed costs) for your present business (base plan) and the whole farm strategy alternative you are considering. The base plan should project the average expected future results for your current farm operation. Do this column first based on past history (Worksheet 2.12) and then build on it for each of your alternative strategies using information from your gross sales revenue projections (Worksheet 4.9) and the whole farm cost analysis (Worksheet 4.30). Then, calculate the net farm income for each alternative by subtracting total expenses from total revenue. How do your proposed alternatives compare to your present business income? Remember, when projecting the income for each strategy alternative, assume that your strategy has been fully implemented.

	Base Plan	Strategy #1	Strategy #2
Revenues:			
Gross product sales			
Cull breeding livestock			
Other income			
Total revenue (a)			
Expenses:			
Annual variable expenses			
Annual fixed expenses			
Other farm expenses			
Total expenses (b)			
Net farm income (a – b)			

TASK 4

Cash Flow Statements show a month by month view of your income and expenses. You can find templates from:

- AgPlan from the University of Minnesota
- MSU Center for Regional Food Systems Loan Readiness Toolbox for Food and Farm Businesses
- Iowa State University Ag Decision Maker (See Below)
  - Comprehensive Financial Statements
  - Cash Flow Statement

CASH FLOW BUDGET (12 period)

Ag Decision Maker -- Iowa State University Extension

Enter your input values in shaded cells.

Name: **Year**

	Individual Time Periods												Total for
PROJECTED INCOME	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	All Periods
CSA													$0
Farmers Markets													$0
Wholesale													$0
													$0
													$0
													$0
													$0
													$0
													$0
													$0
													$0
													$0
													$0
Total Income	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	$0

	Individual Time Periods												Total for
PROJECTED EXPENSES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	All Periods
													$0
													$0
													$0
													$0
													$0
													$0
													$0
													$0
													$0
													$0
													$0
													$0
Total Expenses	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	$0

	Individual Time Periods												Total for
SUMMARY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	All Periods
Net Cash Flow (monthly)	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Beginning Cash Balance													
Cumulative Balance	$0	0	0	0	0	0	0	0	0	0	0	0	$0

IOWA STATE UNIVERSITY
University Extension

Balance Sheets show the value of your farm business. This can be helpful to watch your farm assets grow. It is essential if you're considering selling your farm or on the verge of a farm transition to the next generation.

- MSU Farm Balance Sheet Template
- AgPlan from University of Minnesota
- Iowa State University Ag Decision Maker (See Below)
  - Comprehensive Financial Statements
  - Balance Sheet

Balance Sheet -- Short Form

Ag Decision Maker File C3-19

Ag Decision Maker -- Iowa State University Extension and Outreach

Information File, C3-19, Understanding Net Worth is available for more information on creating a balance sheet.

Enter your input values in shaded cells.

Name	Date

Assets	Cost Value	Market Value	Liabilities	Market Value
Current Assets			**Current Liabilities**	
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
Total Current Assets	**$0**	**$0**	**Total Current Liabilities**	**$0**

Fixed Assets			Fixed Liabilities	
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
	$0	$0		$0
Total Fixed Assets	**$0**	**$0**	**Total Fixed Liabilities**	**$0**
Total Assets	**$0**	**$0**	**Total Liabilities**	**$0**

	Cost Value	Market Value		
Net Worth	**$0**	**$0**	**Working Capital**	**$0**
Net Worth Last Year	$0	$0	**Current Ratio**	**0.00**
Change in Net Worth	**$0**	**$0**	**Debt-to-Asset Ratio**	**0%**

Version 1.2_22025
Contact: Ann Johanns
Original Author: Don Hofstrand
Date Printed:
9/20/2025

IOWA STATE UNIVERSITY
Extension and Outreach

This institution is an equal opportunity provider. For the full non-discrimination statement or accommodation inquiries, go to www.extension.iastate.edu/legal.

Enterprise Budgets help you to see whether or not a crop, livestock type or other income stream is profitable or to figure out if a crop you want to try might be profitable. Once you know, you can raise prices, lower costs or drop the crops that lose you money. And you can grow and sell more of the profitable ones.

It sounds complicated, but really you are just **TRACKING EVERY STEP & COST to grow a crop and subtracting it from the sales numbers for that crop**. You can start by writing down all the steps in growing, harvesting, washing, storing and selling a crop. Then you add the costs for supplies and labor hours. Positive numbers are profitable and a negative number shows you are losing money.

If you grow many crops or have many enterprises, you might want to create two new enterprise budgets each year to help you decide which crops to drop and which to expand to more acreage. It can be too much to try to track every crop at once.

There are many excellent examples and templates for enterprise budgets. Note that enterprise budgets differ greatly from farm to farm and depend on the tools you use, your soil type and yields and your unique farm expenses. Richard Wiswall's Enterprise Budgets from The Organic Farmers Business Handbook is a great place to start, but take time to compare the format and choose a template that works for you:

- Beekeeping Enterprise Budgets
- CSA Farm Economic Analysis
- Cut Flower Enterprise Budgets
- Grains
- Livestock
- Medicinal Herbs
- Transplants
- Vegetables and Fruit

See the next page for one example of an enterprise budget.

Enterprise Budgets - Here is an example from the Iowa Fruit and Vegetable Production Budgets, which are available as spreadsheets or PDFs to print and fill in. https://www.extension.iastate.edu/agdm/crops/html/a1-17.html

Greens, Salad: 100' x 4' bed

	QUANTITY	COST PER UNIT	TOTAL	YOUR QUANTITY	YOUR COST PER UNIT	YOUR TOTAL
RECEIPTS						
Greens sales	50 pounds	$6.00	$300.00			
TOTAL RECEIPTS			$300.00			
PLANTING YEAR						
SUPPLIES						
Seed – cover crop	0.75 pounds	$0.75	$0.56			
Seed	5 packets	4.50	22.50			
Fertilization	10 pounds	0.35	3.50			
LABOR						
Pre-plant	0.75 hours	14.75	11.06			
Plant/transplant	0.20 hours	14.75	2.95			
Weed/pest management	2.00 hours	14.75	29.50			
Interest on pre-harvest costs (6 months)	$70.07	5.8%	2.03			
TOTAL PRE-HARVEST COSTS			$72.10			
HARVEST						
LABOR						
Bags (1 pound)	50 bags	$0.04	$2.00			
Harvest labor/packaging	1.50 hours	14.75	22.13			
TOTAL HARVEST COSTS			$24.13			
TOTAL VARIABLE COSTS						
Per bed			$96.23			
Per pound			1.92			
OWNERSHIP COSTS (ANNUAL)						
Irrigation system			$2.38			
Machinery			11.90			
Land			3.13			
TOTAL OWNERSHIP COSTS			$17.41			
TOTAL COSTS (ANNUAL)						
Per bed			$113.64			
Per pound			2.27			
ANNUAL RETURNS OVER VARIABLE COSTS			$203.77			
ANNUAL RETURNS OVER TOTAL COSTS			$186.36			

Pre-plant labor includes cover crop planting, bed preparation, fertilizer spreading, and irrigation set-up.
Plant/transplant labor includes planting or transplanting, mulching, trellis or cage set-up if needed.
Weed/pest management labor includes weeding, applying pest management materials, and pruning if needed.
Harvest labor includes harvesting, packaging and removal of vines, cages, trellises or other materials from the bed if needed.

Resource List makes it clear what you have now and what you can access in the future. This might include money, loans, infrastructure, markets, etc. This is helpful when your startup costs are too high. It reminds you that you can rent, borrow or do without some tools for now and that you have a network to answer your questions and help when needed.

Resource List	**Farm Name:**	
	Resources I have now	**Resources I can leverage in the future**
Money		
Loans and/or Grants		
Land & Soils		
Infrastructure, buildings, hoop houses		
Wells and Water		
Tools & Equipment		
Skills & Training - Person 1		
Skills & Training - Person 2		
Professional and Social Networks		



SECTION 2

COMMON QUESTIONS

01 Why should I write a farm business plan?

A business plan can be very helpful! **For new farmers**, it can help to make the farm vision more clear and attainable. **For farmers founding a new farm,** it can help you to prioritize phases of the farm build out that you can afford, and help to find markets for selling what you raise. **For farmers seeking loans**, a farm business plan is often required as part of the application process and will need to show that the farmer can make loan payments from farm income or off-farm income. **For multi-generational farms and farm partnerships**, a business plan helps to ensure that everyone is on the same page and can help with farm succession. **For established farms**, a business plan can help to ensure that the farm is financially stable, fits the values and goals of the farmers, and is meeting community needs. For farmers starting a new farm enterprise, the business plan can ensure the stability of current farm operations and increase the chances of success with the new venture.

02 Where can I find examples and templates?



Many organizations offer business plan templates online. Click the links to see the examples below.

- AgPlan from University of Minnesota
- SARE Building a Sustainable Business book
- MSU Center for Regional Food Systems - Loan Readiness Toolbox for Food and Farm Businesses Business Plan Template
- Organic Farmer Training Program - Farm Plan Template
- SCORE Business Plan Template for a Startup Business
- Small Business Development Center Traditional business plan format or Lean startup format
- Canva
- Artificial Intelligence - Use AI by prompting it to "Write a business plan for a farm in (place) that grows (product mix). Be certain to read and then prompt with new features or edit!

03 What is important for a business plan when I apply for funding?



An investor or lender typically requires a business plan that includes at least three years of financial projections. The information you share with them helps them understand who you are as a business owner, your farm's history, and ultimately your ability to repay the loan. When reviewing your plan, a lender will look to understand how you plan to use the funds, market your products, and operate a sustainable business.

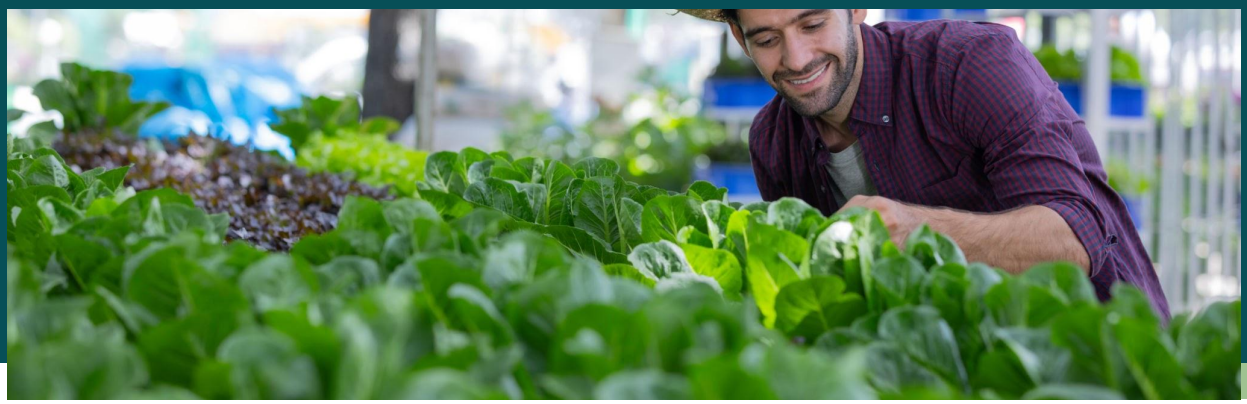
04 What are the sections in a farm business plan?



It is important to write each section of your business plan to ensure you consider the concepts needed to run a farm business. The sections to include are:

1. Executive Summary*
2. Overview and History
3. Market Analysis
4. Marketing Plan
5. Operations
6. Financial Statements
7. Other

*People typically write the Executive Summary last, once the other sections are complete. Other than that you can write the other sections in order from two to six, or can write them in the order that makes the most sense to you.



SECTION 3

From Business Plan to Reality

Building farming skills - Hands-on is the best way to learn to farm. Here are some resources, farms and classes where you can build farming skills:

- MSU Organic Farmer Training Program - Detroit, Lansing, Grand Rapids
- Michigan Sustainable Farm Jobs & Opportunities listserv
- Map of Michigan Beginning Farmer Resources
- Worldwide Opportunities on Organic Farms (WWOOF)
- MSU Detroit Partnership for Food, Learning and Innovation (DP-FLI)
- MSU Student Organic Farm - East Lansing
- MSU Tollgate Farm - Novi
- Keep Growing Detroit - Flint
- Growing Hope - Ypsilanti
- Edible Flint - Flint
- Allen Neighborhood Center Hunter Park GardenHouse - Lansing
- MSU Institute for Agricultural Technology (IAT) - 11 locations and 15 degrees
- Beginning Farmer Curriculum

Who can help with the business skills I need?

- MSU DEMaND videos, bulletins and webinars
- MSU Farm Business Management team
- Greenstone CultivateGrowth program
- SBA - Small Business Administration
- Small Business Development Center (SBDC)
- GROW - Grand Rapids Opportunities for Women
- Michigan Good Food Fund

From Business Plan to Reality

Loans help farmers - Applying for financing can be intimidating! But there are lending programs set up specifically to support farm businesses start or expand your business.

Most loans require a farm business plan and/or off-farm income to ensure loan payments can be paid. Using the Business Planning Chapter of the Beginning Farmer Decision Guide can help you create a vision and goals for your farm and help you be ready if the time comes to apply for financing. Find a list of lenders under **Resources** on the next page.



Keep Growing Detroit helps farmers in Detroit to access NRCS-EQIP funding to build high tunnels. They also provide transplants to over 2,200 farms, gardens and community gardens in the city.

Grants fund projects on farms....
.... It's not free money for farms!

Most grants are very competitive! Grants usually require you to create something useful for the community, beyond your farm..

- Greenstone Cultivate Growth Grants
- Natural Resource Conservation Service (NRCS) EQIP and CSP programs fund on-farm conservation - Find your local office
- Detroit Black Farmer Land Fund
- MSU Center for Regional Food Systems Funding Sources for Food Related Businesses

Mentors advise farmers

- Transition to Organic Partnership Program - For farmers transitioning to organic
- Cultivate Growth Mentorship Program - For Michigan farmers
- SCORE business mentor matching - For all business types
- Begin Farming Mentorship Program - For Midwest farmers with less than 10 years farming experience
- Farmer-to-Farmer Mentoring Program - For Midwest farmers with at least one year of farming experience
- Michigan Sheep Breeders Association Mentor - For farmers raising sheep
- Michigan Beekeeping Clubs - Find a mentor through your local beekeeping club



RESOURCES & PARTNERS

Loans & Grants for Farmers

MSU Center for Regional Food Systems Loan Readiness Toolbox for Food and Farm Businesses **resources**

- Business plan template
- Business plan example
- Financial document templates and examples

- NSAC Farm Bill Programs and Grants
- Grants for Farmers - list and article

Lenders

USDA Farm Service Agency (FSA)

- Loan Assistance Tool and FSA Loan Interest Rates
- FSA micro-loans under $50,000 require 1 year of farm or leadership experience
- FSA Direct Farm Ownership loans over $50,000 require 3 years of farm management experience including financial, production and marketing decisions

- Greenstone Farm Credit Services
- Michigan Good Food Fund
- Kiva US Loans - 0% interest, crowdfunding loans up to $15,000
- Personal loans - be sure to get this in writing!

Also see the *Financing* section of the General Chapter of this guide.

Farm Plan Templates

Many organizations offer business plan templates online. Click the links to see the examples below.

- AgPlan
- SARE Building a Sustainable Business book
- MSU Center for Regional Food Systems - Loan Readiness Toolbox for Food and Farm Businesses Business Plan Template
- Organic Farmer Training Program - Farm Plan Template
- SCORE Business Plan Template for a Startup Business
- Small Business Development Center Traditional business plan format or Lean startup format
- Canva
- Artificial Intelligence - Use AI by prompting it to "Write a business plan for a farm in (place) that grows (product mix). Be certain to read and then prompt with new features or edit!

Goal-Setting Resources

- Goals Worksheet with SMART goals, HEART goals and a timeline from MSU Organic Farmer Training Program
- HRM Goal Analysis from MSU Organic Farmer Training Program
- In-depth HRM Goal Analysis by Atina Diffley

SWOT Analysis

- SWOT Analysis Worksheet from SCORE
- SWOT Worksheet from MSU Organic Farmer Training Program

Online Resources for Market Analysis

- ***US Census:*** ***Quick facts***
- ***2022 Ag Census County Profiles***
- ***USDA Food Access Research Atlas***
- ***USPS Every Door Direct Mail***
- ***Research your competition and potential collaborators***
  - *What is your real competition (fast food? Busy lives? Farms?)*
  - *www.localharvest.org*
  - *Organic Integrity Database*
  - *Taste the Local Difference*
  - *Visit farmers' markets, co-ops, health food stores, grocers, etc!*
  - *Google!*
- ***Michigan Farm to School Map*** ***(10 cents a meal)***
- *Facebook Audience Insights*

Site Planning

- Soil Survey Map
- **Topography Map**
- **Flood Map**
- Wetland Map

Crop Planning Tools

- Crop Template from the MSU Upper Peninsula Research and Extension Center.
- Seedtime
- Tend
- **For vegetables**
  - *Northeast Crop Production Manual*
  - *Northeast Harvest Manual*
- **For row crops**
  - OGrain Compass
  - MSU Grain Marketing Plan Template
  - U of Minnesota Grain Marketing Plans
  - Kentucky Grain Marketing Plans
- **For livestock**, try the
- **For beekeeping**, planning tools might be

Start-up Budgets

- MSU Beginning Farmer Scale of Production Matrix
- MSU Organic Farmer Training Program Start-up Budget Template
- Resource Assessment from Michigan Farm Mentors

Income Statements

- MSU Income Statement Template
- MSU Center for Regional Food Systems Loan Readiness Toolbox for Food and Farm Businesses
- AgPlan
- Iowa State University Ag Decision Maker Comprehensive Financial Statements
- Projected Income Statement on page 223 of the SARE Building a Sustainable Business book

Cash Flow Statements

- AgPlan from the University of Minnesota
- MSU Center for Regional Food Systems Loan Readiness Toolbox for Food and Farm Businesses
- Iowa State University Ag Decision Maker
  - Comprehensive Financial Statements
  - Cash Flow Statement

Balance Sheets

- MSU Farm Balance Sheet Template
- AgPlan from University of Minnesota
- Iowa State University Ag Decision Maker
  - Comprehensive Financial Statements
  - Balance Sheet

Enterprise Budgets

- Enterprise Budgets from The Organic Farmers Business Handbook
- Iowa Fruit and Vegetable Production Budgets.
- Beekeeping Enterprise Budgets
- CSA Farm Economic Analysis
- Cut Flower Enterprise Budgets
- Grains
- Livestock
- Medicinal Herbs
- Transplants
- Vegetables and Fruit

Grants for Farmers

- Greenstone Cultivate Growth Grants
- Natural Resource Conservation Service (NRCS) EQIP and CSP programs fund on-farm conservation - Find your local office
- Detroit Black Farmer Land Fund
- MSU Center for Regional Food Systems Funding Sources for Food Related Businesses

Mentors

- Transition to Organic Partnership Program - For farmers transitioning to organic
- Cultivate Growth Mentorship Program - For Michigan farmers
- SCORE business mentor matching - For all business types
- Begin Farming Mentorship Program - For Midwest farmers with less than 10 years farming experience
- Farmer-to-Farmer Mentoring Program - For Midwest farmers with at least one year of farming experience
- Michigan Sheep Breeders Association Mentor - For farmers raising sheep
- Michigan Beekeeping Clubs - Find a mentor through your local beekeeping club

Building Farming Skills

- MSU Organic Farmer Training Program in Detroit, Lansing and Grand Rapids
- Michigan Sustainable Farm Jobs & Opportunities listserv and webpage
- Map of Michigan Beginning Farmer Resources
- Worldwide Opportunities on Organic Farms (WWOOF)
- MSU Detroit Partnership for Food, Learning and Innovation (DP-FLI)
- MSU Student Organic Farm - East Lansing
- MSU Tollgate Farm - Novi
- Keep Growing Detroit - Flint
- Growing Hope - Ypsilanti
- Edible Flint - Flint
- Allen Neighborhood Center Hunter Park GardenHouse - Lansing
- MSU Institute for Agricultural Technology (IAT) - 11 locations and 15 degrees
- Beginning Farmer Curriculum

Building Business Skills

- MSU DEMaND videos, bulletins and webinars
- MSU Farm Business Management team
- Greenstone CultivateGrowth program
- SBA - Small Business Administration
- Small Business Development Center (SBDC)
- GROW - Grand Rapids Opportunities for Women
- Michigan Good Food Fund

GENERAL TOPICS

Environmental Risk



AUTHORS & INSTITUTIONS

Sarah Zeiler, Environmental Management Educator, Michigan State University Extension

SECTIONS

Section 1: Environmental Risks

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Owning a farm and managing land brings a responsibility to manage the land and resources of the land with care for the future as a steward. Considering the environmental impacts of the operation can reduce environmental risk and financial liability and, in some cases, allow for participation in programs that can pay the operation for good stewardship.





How To Get Started



Environmental stewardship starts with being honest with yourself about your actions and the impacts of those actions on the environment and the future. Not all impacts can be mitigated entirely, but reduced impact will leave you open to less risk and is more likely to leave a legacy for future generations.

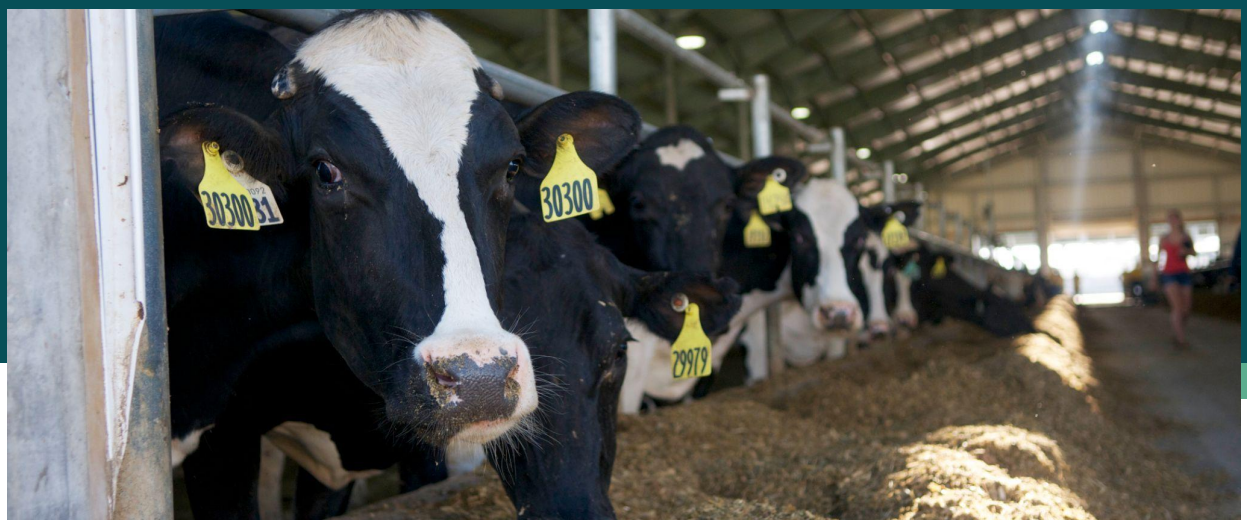
Begin by assessing your environmental impact using a tool like the ***Michigan Agricultural Environmental Assurance Program***. You can access this program through your local Conservation District. Remember that each enterprise will have its unique risks. Take a look at enterprises that may seem benign more closely as they may have hidden risks; for example, organic agriculture seems like it would have lower risk environmentally, however, it uses more tillage than traditional no-till farming and is at a high risk for soil erosion.

Once you have honestly assessed your environmental risk, make a list of changes you can make to lower this risk. Some items on this list can be easy to fix, like putting gutters on a building; others may take time like improving soil health.

You may want to seek technical or financial assistance with accomplishing items on this list. Agencies that can help with technical assistance are ***Michigan State University Extension*** and the ***Natural Resource Conservation Service (NRCS)***. Financial assistance is accessible through ***NRCS, the Farm Service Agency (FSA), and Conservation Districts***. Grants may also be available through other agencies. Lists of granting agencies that beginning farmers can access are available through MSU Extension. Carrying out these improvements can be daunting, however assembling a team of trusted advisors can make the work feel like it isn't on your shoulders alone.

Environmental Risk, unlike other kinds of risk, may seem less urgent. It has a way of building over a long period until something gives way to a rush of problems. Being vigilant and steadily working on your plan for sustainability can curb, or at least temper, future disasters.





SECTION 1

Environmental Risks

Primary Considerations

- Soil health
- Water quality
- Waste management
- Climate preparedness
- Energy efficiency



Process for Getting Started

- Assess environmental impact
- Make a list of areas to be improved
- Seek out technical and financial support, if needed
- Carry out improvements
- Re-assess environmental impact and adjust

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.





ENVIRONMENTAL RISKS

COMMON QUESTIONS

01 How do I soil test?

First, plan on where to sample. Split the area so that samples represent no more than 40 acres. This area can be grouped by management, cropping history, topography, or soil type.

Next, decide on a sampling depth. Your crops and tillage will decide sampling depth in the future, but starting with the top 6" is generally considered a good practice.

Now, collect soil cores. You can use a spade or a soil probe. You will take 20 samples in total. Place these samples in a bucket. Mix the soil samples in the bucket—pour the sample onto a newspaper to dry overnight. Fill a sample bag with the dried sample. Be sure to send the amount of soil requested by the lab.

Complete any forms for the laboratory and pack the sample. Follow the lab's instructions to send the sample and forms.

02 How do I dispose of manure?

Developing a manure management plan may seem like a difficult task, or something done by large farms, but the components of a plan can be applied to all types of farming operations. A common misconception is that manure management must be an all-or-nothing approach. This is not necessarily the truth as many plans are developed and implemented using an integrated approach. Many small farms can benefit by looking at the components of a manure management systems plan, evaluating what is feasible for your farm, and understanding what options may be available. It also enables you to develop a sustainable plan for the future by reducing environmental risk and streamlining fertilizer costs. Follow the steps in the Small Farm Manure Management Planning resource.

03 I feel like I am fighting the weather. Is there anything I can do?

Risk is not new to farming but the increasingly variable climate has become more impactful. The key to working with the weather is how you prepare and respond. The Climate Ready tool was developed using the current body of research around mitigation and adaptation to climate. This tool is for inward reflection, looking to help each unique farm find the best choices for their operation. Since each farming system has a built-in amount of risk, achieving a "no risk status" is nearly impossible. So the goal is to move the bar towards less climate risk.

04 How do I get my pesticide applicator's license?



You may become certified as a private or commercial applicator in Michigan. You can take the test for this certification through the Michigan Department of Agriculture. You can buy study materials, like **The National Pesticide Applicator Certification Core Manual,** through Michigan State University Extension. You may also choose to take a preparation course with MSUE before your exam.

05 Can I get help paying for any of this?

Yes, you can receive assistance to start making your farm business more sustainable. Contacting the partner agencies listed below is the first step. These agencies will help you develop a conservation management plan that can mitigate any resource concerns on the farm. They will also guide you to funding opportunities for cost share, grants, and loans.



RESOURCES & PARTNERS

Necessary Resources

Soil Testing

- https://www.canr.msu.edu/resources/the-anatomy-of-a-soil-test-report
- https://www.canr.msu.edu/soil_health/uploads/files/Soil%20Sampling%20Guide.pdf

Manure Management

- https://www.canr.msu.edu/resources/small-farm-manure-management-planning

Climate Readiness

- https://climateready.rsgisnext.msu.edu/

Pesticide Safety

- https://www.michigan.gov/mdard/licensing/pesticide/pesticide-applicator-certification
- https://www.canr.msu.edu/news/revised_core_pesticide_applicator_rup_study_manuals

Financial Assistance

- https://www.michaelfields.org/grants-advising-resources
- https://www.nrcs.usda.gov/

Partners

- **Natural Resource Conservation Service**
  https://www.nrcs.usda.gov/
- **Farm Service Agency**
  https://www.fsa.usda.gov/
- **Conservation Districts**
  https://www.macd.org/
- **U.S. Fish and Wildlife Service**
  https://www.fws.gov/
- **Pheasants Forever**
  https://www.pheasantsforever.org/
- **Michael Fields Institute**
  https://www.michaelfields.org/grants-advising-resources

General

Farm Labor



AUTHORS & INSTITUTIONS

Zachariah Rutledge, Assistant Professor, Agricultural, Food, and Resource Economics, Michigan State University

Florencia Colella, Farm Business Management Educator, Michigan State University Extension

SECTIONS

Section 1: Job Design and Description
Section 2: Employee Recruitment
Section 3: Hiring and Onboarding
Section 4: Employee Retention

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

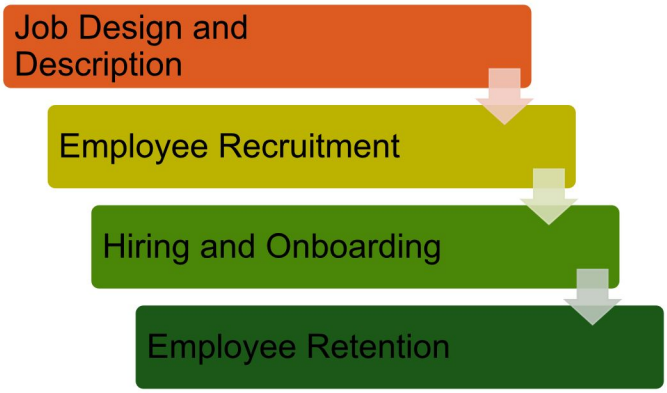
Sponsored by:

GreenStone® FARM CREDIT SERVICES

INTRODUCTION

Industry sources indicate that recruitment of new farm employees often comes by word of mouth from existing employees who reach out to family members and friends to fill job vacancies at a farm. For new farms, the process will likely differ. In this chapter, we will cover some of the basics of getting started with labor on the farm. You should also research your local, state, and federal guidelines to make sure you are in compliance with the law as you hire and start employing workers. At a minimum, you should be aware of the applicable minimum wage and other workplace rules that agricultural employers must abide by.

How To Get Started



When hiring farm employees for your new business, consider starting by developing a job description and posting it online through platforms like MichiganWorks! Once you have posted your job description, you will want to vet employees through an interview process, select the employees you want to hire, and put them through an onboarding process to get them up to speed with the tasks they are going to perform for your company. After employees are hired, you may want to consider developing employee retention strategies so you don't lose good employees to other businesses.



SECTION 1

Job Design and Description

Hiring the right employees is one of the most important aspects of a business. Some people say "**without the right people, no amount of money can make a business succeed.**"

Businesses need qualified staff to help them run smoothly. Hiring is one of the most difficult decisions a business can make. Hiring someone who can't do the job or won't do it the way you want it to be done can be costly. Moreover, hiring the wrong people can create unnecessary stress and lower the company's profitability. Bad employees shift attention from running the business to making sure the employee doesn't make mistakes. They can also lower staff morale, endanger the business' assets and equipment, and lead to increased conflict in the workplace. To avoid hiring bad employees, you can implement a standard hiring process.

You can start by developing a job description. A job description should contain the following details: the major tasks that need to be completed, the job duties and responsibilities, and the job specifications. The job specifications should include the types of qualifications required for the job, sometimes referred to as "skills." Examples of skills may include: **time management, computer skills, problem solving, teamwork, etc.**



The following list includes the elements of a good job description:

- Job title
- Worksite location
- Whether it is full-time or part-time
- A brief overview of the company
- Information about fringe benefits (holiday pay, vacations, health insurance, etc.)
- Key duties and responsibilities
- Key skills required for the job (bullet points are helpful)

Primary Considerations

- Recruiting the right employees is very important for a business.
- Bad hires can be very costly to a company.
- Businesses need to provide a job description.
- There should be a plan for the selection and interviewing of job candidates.
- Ultimately, the goal is to find the most qualified candidate for the job.

Process for Getting Started

- Determine details about what is required for the job you need to fill
- Design your job description and specifications





SECTION 2

Employee Recruitment

Recruiting is the process of creating a pool of qualified candidates for a job opening. Some of the recruiting options include posting job descriptions on the internet, posting a sign and interviewing "walk-ins," and hiring the services of a recruiting agency.

The goal of a job applicant is to match their qualifications (or resume) to the job they are applying for. The goal of a recruiter is to listen to the job applicants, let the applicant know what the expectations are, respond to the applicant's questions, and find the best candidate for the job. There are four steps to the hiring process, which are listed below:

1. Determine who will create the list of qualified applicants
2. Review the applications
3. Create the list of qualified applicants
4. Interview the candidates



The person who will create the list of qualified applicants should be the person who has the most insight into the job being advertised. If the opening is for a manager position, it might be best for the business owner to select who is qualified. If the position is for a laborer position, it might make sense for someone with managerial experience to select the list of qualified applicants. It is important to make sure that everyone involved in the hiring process has a copy of the job description, understands the position's roles and employee responsibilities, and understands the job selection criteria. When interviewing multiple candidates, make sure to ask them all the same questions. It can also be helpful to create a ranking form where you can take notes.



When interviewing candidates, give yourself time to reflect before making a decision. Moreover, you should ask for three work-related references and check them to ensure accuracy of the candidate's statements. When you call references, you can use a reference form to record their answers (see for example **14 Questions You Should Ask When Checking References**).

When you make a job offer, it is good practice to put it in writing. You can email it or deliver it to them in person. Also, it is important to make sure you meet all the legal requirements with respect to the terms of employment. For example, you should check state and federal laws for minimum wage and overtime pay requirements. Ignorance is not a valid legal defense to labor law violations.

Primary Considerations

- Post your job listing
- Decide who is going to do the interviews

Process for Getting Started

- Research common advertising platforms
- Discuss amongst your existing business partners who is going to interview job candidates



SECTION 3

Hiring and Onboarding

The process of choosing the best candidate for the job is known as employee selection. An application standardizes information so it is easier to compare applicants. After sorting through the applications, you will want to select four to five finalists to interview. The initial interviews can be virtual or by phone, and some interviews may require some basic testing. Once you conduct the initial interviews, you will want to select one to three candidates to conduct a second interview with. When you do the second interview, you may also want to do a background check, including credit, criminal history, references, and web searches (including social media). Once you have selected the candidate you are going to make a job offer to, you should provide a conditional job offer, which typically consists of an offer with some kind of drug screening and a physical examination if necessary.

The practice of onboarding includes the set of actions the business takes to get new hires up to speed and "on board" with the company. Onboarding is important because it helps make sure the employee really knows what to expect and how to do it, and it will set the employee up for success. Onboarding can include employee orientation and training.



New employees can form opinions about the company quickly, so it is important that their initial experiences are positive. Employees who start off on the right foot tend to be happier and more productive, and they tend to stay with the company longer, which reduces costs. Orientation involves teaching the employee about the business, signing them up for benefits, and doing all the legal paperwork. Orientation may also include introducing the employee to their coworkers. If you find yourself in a management role where you are onboarding employees, use common sense and make sure to teach the employees what they need to know.

Some of the types of questions you should be prepared to answer are listed below:

- What exactly will I be doing?
- Who is my boss, and who do I take instruction from?
- What are my work hours?
- When and where do I take lunch breaks?
- Who do I go to if I have questions?
- When and how do I get paid?

Typically, new employees are not a perfect fit for the job, so they need to be trained. Employee training involves teaching the employee about the skills they will need and their duties on the job, and this will sometimes consist of both formal and informal "on-the-job" training.



To develop your employee training routine, you must first assess what your needs are and figure out how you need to shape the employee's behavior. It is good practice to design a training routine, deliver the training, and then assess whether the training was effective at meeting its goals.



First, you will want to make the new employee feel comfortable, help them get prepared, and allow them to ask questions. Next, you should show the new employee the task that needs to be done and watch the employee repeat the task. Then you can assess the employee's work and give them tips for improving while allowing them to try the task again and again until they get it right.

Then, once the employee is good enough to do the task on their own, check in with them frequently during the first few weeks to make sure they are on track to be successful and follow up with them if they need a refresher.

You can use the following five-step process to train employees to do certain tasks:

1. **Get Ready:** Explain what you are going to teach them and why it is important.
2. **Step-by-Step Explanation:** Explain the task step-by-step.
3. **Demonstrate:** Show how the task is done, let them ask questions.
4. **Repeat:** Ask employees to explain the process back to you.
5. **Confirm:** Have employees perform the task while you watch.

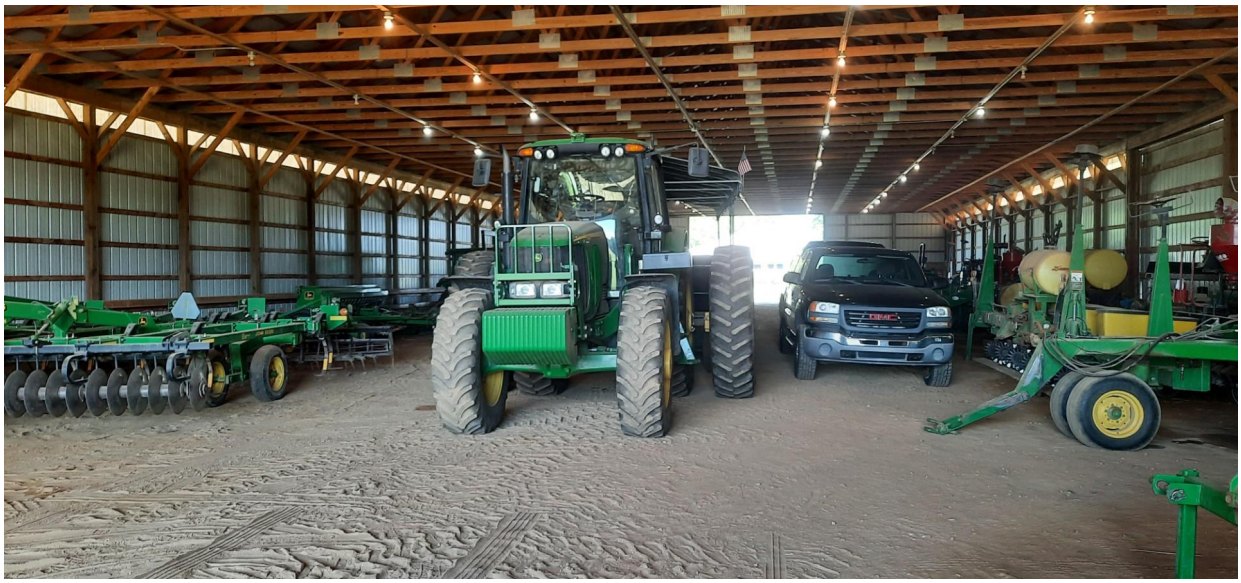
If your employees speak Spanish, you should consider having someone interpret your orientation or have someone that speaks Spanish perform the orientation. You should also explain why certain tasks are being done and point out the hazards of the job. The employee should have a good understanding of the safety procedures and regulations.

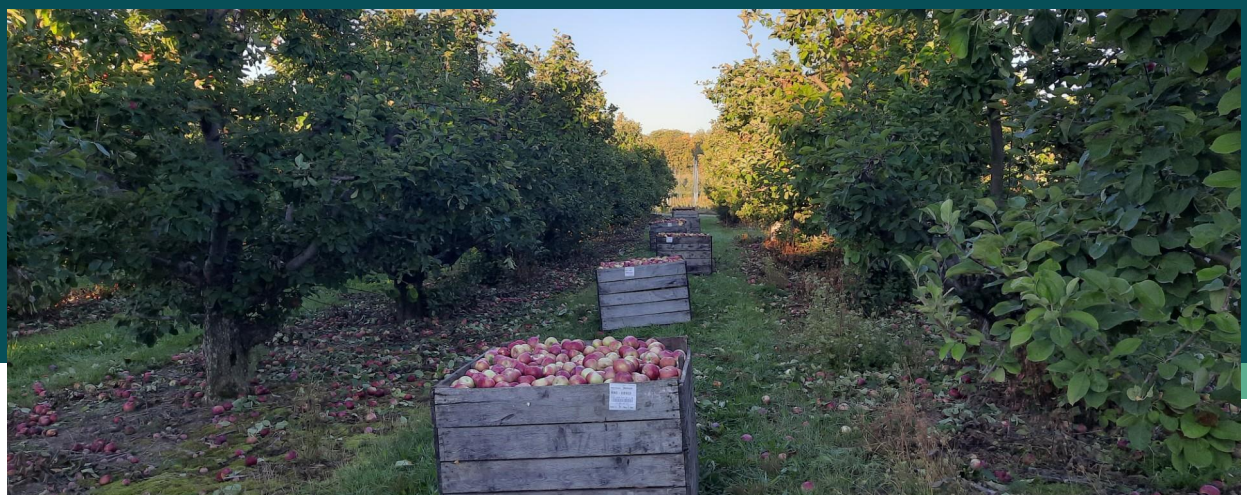
Primary Considerations

- Employee selection is important. Bad hires cost time and money and reduce farm productivity and profitability.
- Onboarding gets new employees up to speed on the job.
- Onboarding can include orientation and training.
- Proper training is important for new employees.

Process for Getting Started

- Determine who is going to train the employees
- Make sure that someone can speak the language of the employees (e.g., Spanish)
- Provide hands-on training experience to get employees up to speed





SECTION 4

Employee Retention

Employee retention is a top concern for many farms; however, few farm managers or owners take the time to talk to their employees to determine what will make them stay. Some reasons why people change their jobs include higher pay, better work-life balance, and geographic preferences, to name a few. Retaining employees starts with recruiting the right employees.



STRATEGIES FOR GOOD EMPLOYEE RETENTION

During recruitment, differentiate your company from others in a meaningful way.

- Explain how your company is interesting and different from others
- Small and mid-sized companies that are interesting to employees have high growth rates

Identify what talents your employees have.

- Put employees in a position where they can use their talents
- Allow employees the opportunity to develop their skills

Listen to employees and develop personal relationships with them.

- Help employees resolve their problems
- Make sure employees know they are being cared for

Offer compensation items that solve some type of personal problem.

- Child care (if feasible)
- Scheduling flexibility
- Housing (if feasible)

Primary Considerations

- There are a number of reasons why people leave their jobs. Many of them involve compensation or work amenities (e.g., location, housing, bad management).
- Retaining employees is a number one concern for employers.
- There are steps you can take to help retain good employees.

Process for Getting Started

- Determine what types of things can help address employee problems
- Offer solutions to employee problems to create a situation where they want to stay employed at your company. Examples might be scheduling flexibility, access to housing, etc.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



FARM LABOR

COMMON QUESTIONS

01 Where do I source employees from?

Sourcing employees can come from recruiting employees within the US or recruiting foreign temporary guest workers through visa programs such as H-2A or TN. You can post job descriptions or try to recruit from word of mouth. If you want to hire H-2A employees, you might want to consider hiring an agency to recruit the workers for you. There are several agencies in Michigan that recruit H-2A workers, such as Great Lakes Ag Labor Services.

02 What do I need to know about the H-2A program if I want to use it?

The H-2A application process is administratively burdensome and somewhat complex to navigate. Employers need to provide evidence they have attempted to recruit domestic workers and were unable to, file an application within a specific timeframe, and adhere to a number of program rules, including paying employees a super-minimum wage known as the Adverse Effect Wage Rate and paying employees at least 3/4 of the hours in the contract. There are many other rules of the program, and rules may change from year to year, so employers need to stay up to speed on them.

Organizations such as the National Council of Agricultural Employers provide timely information about emerging H-2A rules and how to stay in compliance with them. You can also find the legal language of new H-2A rules in the Federal Register.

03 What are best practices for recruiting and retaining a sufficient labor force?

Following an identical interview process for similar employees and taking notes during interviews can help you select employees when you get ready to hire them. Offering compensation items, such as scheduling flexibility or housing, and establishing good relationships with your employees can help retain them over time.

04 What laws do I need to follow once I hire employees?



Employers must pay the maximum of the applicable state or federal minimum wage and follow all OSHA guidelines. Moreover, toilets and hand washing facilities for field laborers must be located within a quarter mile walk, and there must be at least one toilet and hand washing facility for every 20 employees. Potable water shall be provided and placed in locations readily accessible to all employees. You should consult official government sources or a labor attorney to make sure you are in compliance with the law.



RESOURCES & PARTNERS

Necessary Resources

- MDARD Agriculture & Foreign Labor Services
- 1928.110 - Field Sanitation. | Occupational Safety and Health Administration
- H-2A Temporary Agricultural Workers | USCIS
- Labor and Personnel Management in the Agri-food System
- Michigan Works!
- MSU Overview of Youth Employment (Child Labor) Provisions of the Fair Labor Standards Act (FLSA) for Agricultural Occupations
- Federal Register
- TN USMCA Professionals

[Agricultural Employment Under the Fair Labor Standards Act (FLSA)]

[MDARD Agricultural Operations Standards]

[Michigan Minimum Wage Rate 2025 Increase Schedule]

[Labor Laws and Michigan Agriculture]

[TN USMCA Professionals]

General

Funding your Farm: Financing, Grants & More



AUTHORS & INSTITUTIONS

Samantha Stokes, former Food & Farm Business Outreach Specialist, Michigan State University
Katje Armentrout, former Community Food Systems Educator, Michigan State University
Jamie Rahrig, Senior Academic Specialist, Michigan State University
Teresa Crook, Field Crops Educator, Michigan State University Extension

SECTIONS

Section 1: Grants
Section 2: Loans
Section 3: Alternative Funding Sources

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Note: If you are reading this section and do not have a business plan please visit the Business Planning section of this resource guide. Also check out the ***Loan Readiness Toolbox for Food and Farm Businesses*** *for more information on business planning and funding needs.*

Before you even consider searching for funding, you need to be able to clearly communicate how you will grow and sustain a successful business into the future through the creation of a business plan. A good business plan describes where, when and how a business will grow by providing a market analysis, outlining the business's current state, detailing how the owner's experience will support success, and projecting the business' plan for sustainability. This business plan provides direction by identifying and unifying owners, employees, stakeholders and investors around shared goals, outlines a course for achievement and provides a framework for the (re)assessment of progress along the way. (Rahrig, Bolan-Williamson, Stokes & Lower 2023).

A comprehensive business plan is vital for farmer's seeking financing, as it demonstrates the owners' plan for how to maintain long-term profitability and ability to meet debt obligations. A detailed business plan not only shows lenders you have planned for a financially stable future, but also helps them assess the type and amount of necessary funding (Rahrig, Bolan-Williamson, Stokes & Lower 2023).

How To Get Started

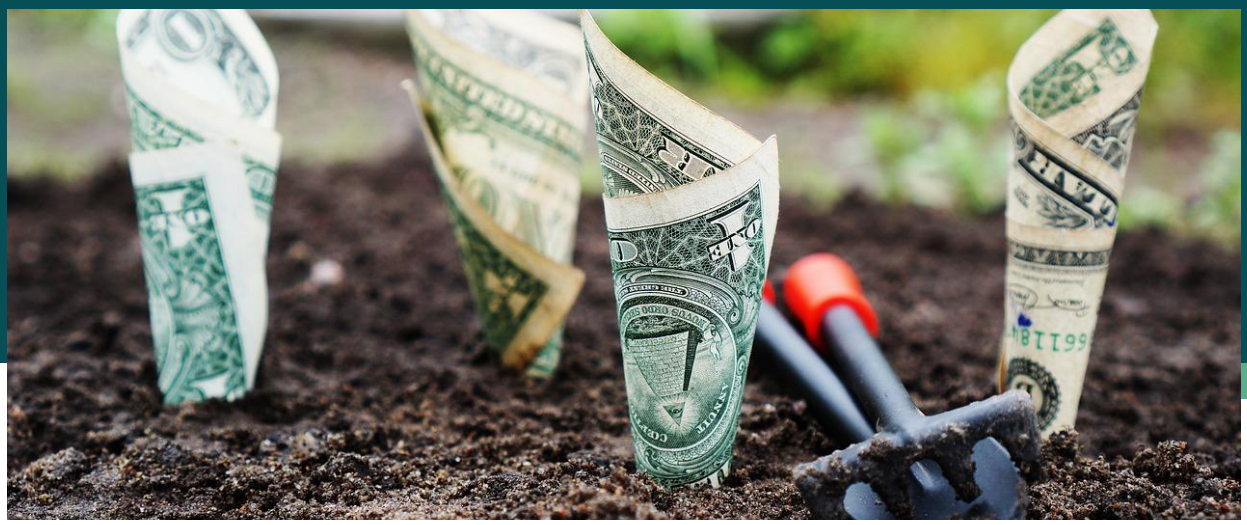
Some point during the life of any business, outside funding sources will be required to support startup, operations, expansion, process optimization, etc. Farms are no different. This section of the Beginning Farmer Decision Tree was created to help beginning farmers understand what funding types exist, and the key considerations to help decide on a funding path right for their operation, based on a variety of key factors. For each type of funding: grants, debt financing and crowdfunding, we have included a variety of resources (end of section) to help you find an individual lender right for you and provide the documentation necessary to approach them with a funding request.



Primary Considerations

These factors will help you first determine what type of funding is the best fit for your farm's current phase. Once you have made this decision, the same considerations can help you find a specific lender/grant/campaign for your best fit.

- **Financing Amount**
- **Stage of Business**
  - Concept
  - Startup
  - Early Growth
  - Scaling/Expansion
  - Mature
  - Dissolution
- **Business Identity**
  - Type: Farm/Producer, Aggregator, Distributor, Co-oP, etc.
  - Business Demographics/Owner Identity
  - Business Geographic Location/Service Area
  - Mission Alignment
- **Location**
  - Rural
  - Urban
- **Use of Funds**
  - Land/Infrastructure purchase
  - Equipment
  - Inventory/Labor/Operating Funds
  - Debt Consolidation/Refinance
- **Growing Methods**
  - Traditional
  - Organic
  - MAEAP
  - Conservation Programs
- **Ownership**
  - Woman-owned
  - Minority-owned
- **Timeline**



SECTION 1

Grants

A grant funder supplies money to an individual/organization/business to fund their ideas, work, projects, etc. without the expectation of repayment (unlike a loan where repayment is expected). These funders may be governments, private foundations or nonprofits, and each has their own reasons for grant making.



Funders work to achieve these goals by providing grant funding on “priority topics” or “impact areas” meeting organizational priorities, donor requirements, endowment stipulations and/or IRS regulations (Armentrout 2024).

The most successful grant writers are those who seek out grants and develop proposals by demonstrating their ability to help the funder meet their program goals/priorities. This starts with developing a prospect list of funders and/or individual grants (many of which request proposals annually) based on the "primary considerations" listed at the beginning of this section (Armentrout 2024).

A good prospect list includes:

- Funders who fund farm businesses in your geographical region.
- Funders whose priority topics/impact areas match your farm's needs AND/OR
- Funders that have demonstrated consistent giving in your area of interest (Armentrout 2024)





SECTION 2

Loans

A loan is a sum of money borrowed and has the expectation of repayment. Different types of loans will come with different terms and conditions. Terms and conditions refer to how long a business will have to pay off the debt, the amount paid each month, or interest rate charged.



The terms on debt financing like a loan will vary based on a person's credit, business history, available collateral, etc. The variability of repayment terms, conditions, and interest rates is captured in **this table from the Michigan Good Food Fund**.

Below is a brief overview of the terminology used to the types of loans you may encounter while searching for financing.

Remember, overlap of terminology and, meaning the types of loans described below are not mutually exclusive. For example, a microloan can be used for operating expenses or equipment purchase depending on the lender's requirements. The links within the text, as well as the resources at the end of this section will offer you a deeper understanding of this broad topic, but as a general rule you will always get the best information on any type of loan directly from the loan provider/servicer.

Capital/Term Loans

Loans provided to purchase capital assets used for the farm such as breeding livestock, equipment, facilities or real estate. These loans are paid back over a longer period of time, usually 5 - 10 years (DEMaND Bulletin E-3425).

Farm Ownership Loans

Also known as a real estate or land loan, this type of loan is used to purchase and/or build land or infrastructure (DEMaND Bulletin E-3423; USDA FSA, 2023; Capital Farm Credit, 2024)

Equipment Loans

A type of capital loan specifically for the purchase of farm equipment (Capital Farm Credit, 2024)

Farm Operating Loans

Loans used to cover the daily operating expenses of running a farm such as production supplies, equipment, livestock, etc (DEMaND Bulletin E-3423; USDA FSA, 2023; Capital Farm Credit, 2024)

Farm Production Loans

An annual type of operating loan used to purchase annual inputs such as livestock for resale, seed, fertilizer, chemicals and other supplies. This type of debt is taken on with the understanding repayment is due after one production cycle, typically within 12 - 18 months depending on when farm products are sold. The primary sources of collateral for these loans are farm production or normal income security (DEMaND Bulletin E-3425).

Microloans

A more flexible, non-traditional form of small loan (usually no more than $50,000) requiring less documentation around length of operation, business credit, production yield history, etc. (DEMaND Bulletin E-3423; Michigan Good Food Fund; USDA FSA, 2019)

Guarantees Loans

These loans are available to farmers who may not otherwise qualify for a loan from a commercial lender (bank, credit union, etc). To increase access to capital for these types of loan applicants, a mission-driven organization such as the USDA FSA or Fair Food Network (FFN) guarantees the majority of the loan's loss and provides oversight of participating commercial lenders (USDA FSA, 2023)

Line of Credit

A more flexible type of loan, functioning similar to a credit card, offering limited amounts of funds and can be (re)assessed as needed and re-paid immediately or at set intervals. These funds are often revolving, once you pay back funds, they may become available again and usually interest-only payments are due as a minimum. Lines of credit can be a good option for farms needing additional operating funds, but they might be smaller or less predictable than a traditional loan would require (Fanslau, 2019).



SECTION 3

Alternative Funding Sources

Crowdfunding

Crowdfunding is the practice of raising money for a project or venture by gleaning many small donations from a large number of people who support your business' mission/goals/product. Often done online, this type of fundraising is easily accessible both to business owners and a wider array of investors with varying financial resources. This method also works simultaneously to build a customer base with a vested interest in your business (Rahrig, Bolan-Williamson, Stokes & Lower 2023).

Crowdfunding types include **donation**, **debt, equity** and **reward-based**.

Donation-based models involve contributors investing based solely on support for the business/product, and do not offer them monetary gain, versus **debt-based models** which offer contributors a return on investment.

Equity-based crowdfunding guarantees contributors receive a share of the business based on their investment and other crowdfunding campaigns may offer goods/services to those who contribute. These types of fundraising platforms are relatively new, and change quickly so it is recommended that entrepreneurs interested in this type of funding do their own research and communicate with platforms directly to get the most accurate information. **The State of Michigan's Licensing and Regulatory Affairs** offers suggestions on important factors to keep in mind such as terms of use, laws and regulations that affect how a business can expect to access capital via crowdfunding (Rahrig, Bolan-Williamson, Stokes & Lower 2023).

Royalties

An alternative form of investment in which an outside entity pays your business to use or obtain rights to intellectual property or real estate assets (Rahrig, Bolan-Williamson, Stokes & Lower 2023).

Equity

Owner/founders may sell a percentage of their business to an investor who then is entitled to that share of the business' future profit (Rahrig, Bolan-Williamson, Stokes & Lower 2023).



FUNDING YOUR FARM

COMMON QUESTIONS

01 Is there a grant to fund this?

Probably! Grants are competitive pools of money of funders/donors of all scales and varieties award to individuals/businesses as a mechanism to further funder goals/mission. You can submit and receive grants from state and federal governments, private foundations, non-profits, local development agencies - the opportunities are endless, and the limiting factor is generally 1) finding the grants; 2) ensuring your farm meets the grant's eligibility requirements; 3) having the capacity and knowledge to apply for them and 4) successfully achieving AND REPORTING ON the stated outcomes. See the "grant" section below for information on when a grant might be the right funding choice for your business, how to stay informed on what grants exist and what resources can help you learn how to write grants to receive funding.

02 Can I request a grant from the Michigan Good Food Fund?

No, the MGFF is a lending network, not a grant program. The **mission driven lenders** in the MGFF network provide **flexible financing** and tailored business assistance to support the success of food and farm entrepreneurs and to grow a more resilient, inclusive local food system.

03 Who is the best lender to request a loan?

It depends! You can use this section to help determine which characteristics of your business may require financing needs. This may require different loan because a loan servicer may have a better fit compared to others. However, as a general rule it is best to pursue loans which will offer you the lowest interest rates and require the least amount of collateral. So, our team generally recommends pursuing "traditional" financing from local banks/credit unions first (prioritize institutions you already have a relationship with), then looking into loans from the United States Department of Agriculture including Farm Service Agency (FSA), Farm Credit Services and then loans from **Community Development Financial Institutions** (CDFIs) or other mission-driven lenders such as those in the MGFF.



RESOURCES & PARTNERS

Necessary Resources

Financing Readiness Tools

- MSUE Farm Business Loans Resources

Bulletins

- E-3407: How to Motivate Your Lender to Say, "Yes"
- E-3423 Farm Management Experience Resource Guide
- E-3425 Loans & Security: An Introduction to Farm Collateral
- E-3428 Farm Loans and Credit Underwriting: The Five C's of Credit

Templates

- Balance sheet
- Income statement
- Cash Flow
- Farm Finance Scorecard

- Loan Readiness Toolbox for Food and Farm Businesses
    - Toolbox Google Drive Folder
- Loans & Security: An Introduction to Farm Collateral
- Time Management Workbook for Food and Farm Entrepreneurs
- Grant Writing for Food Entrepreneurs D2L Course

Finding Funds

- **For an up-to-date Comprehensive List See:** Funding Sources for Food Related Businesses

  See some of the most commonly used/key funding options below:
- **Financing**
    - USDA FSA Farm Loans Overview
    - USDA Guide to FSA Farm Loans
    - USDA Farm Service Agency Loan Programs
    - Michigan Good Food Fund
    - Greenstone Farm Credit Services

- **Grants**
  - Government
    - Grants.gov
    - Business Builder Awards, Great Lakes-Midwest Regional Food Business Center
    - MI Department of Ag & Rural Development
    - United States Department of Agriculture
      - Rural Development
      - National Institute of Food & Agriculture
      - Local Ag Market Program
    - Sustainable Agriculture Research & Education
    - GrantStation & GrantScape
  - Foundations/Corporate Giving
    - Council of MI Foundations
    - Foundation Directory Online (FDO) by Candid
    - GrantForward
    - GrantAdvisor

Partners

- MSU Center for Regional Food Systems
- MSU Product Center
- MSUE Farm Management
- MSUE DEMaND

General

Land Access



AUTHORS & INSTITUTIONS

Katie Brandt, MSU Extension, MSU Organic Farmer Training Program

Jill Dohner, Director of MIFarmLink

SECTIONS

Section 1: Urban Land Access

Section 2: Buying Farmland

Section 3: Leasing Farmland

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



Fifth-generation farmer Kyle Mitchell leads a tour of his land for new farmers in the MSU Organic Farmer Training Program

CHAPTER NAME

INTRODUCTION

***Land is sacred and abundant**, offering sustenance, healing and culture. Land is the source for everything we use and enjoy each day. Those tending land can choose how to give back. Is your main goal to earn a livelihood through the important work of farming? Will you meet an environmental responsibility to care for soil, air, water and wildlife? Or will you meet community needs by feeding people, teaching youth or engaging with neighbors? Are there other values that you'll center in stewarding this land?*

Yet, **farmland is so expensive and seems out of reach** to many who want to farm. It can be hard to understand all the options for finding, leasing and buying land. This resource is an attempt to lower the many barriers to land access, through these 3 sections:

1. **Urban Farmland** is the only affordable option to start a farm for some new farmers. But for many urban growers, transforming vacant lots into abundant gardens and farms is a way to create positive change in their neighborhoods and cities. Many new and established urban farms are non-profits, schoolyard gardens, community gardens, job training centers and gathering spaces.
2. **Buying Farmland** is an option for farmers with savings, stable off-farm income and/or the credit and resources to get a loan for farmland. The benefits of buying land are long-term assurance that you can stay and having more freedom in how to use the land, as allowed by local zoning. With high land prices and interest rates, this can be risky financially and for farmer mental health. This guide will walk through good steps for buying land.
3. **Leasing Farmland** is much more affordable, often with prices of only $100 to $150/acre per year for rural land without irrigation or buildings. But there is a real risk of the landowner revoking your lease or restricting what you can do.

Before digging in, take a moment to close your eyes and consider how you would honor the land and community where you want to farm.

Primary considerations

- Farmland Goal-setting
- Finding farmland
- Assessing farmland
- Buying farmland
- Leasing farmland



Beekeepers often tend hives on land they do not own.

So you want to own land? Can you afford it? Can you commit long-term to one place?

Would leasing be a better fit?

Or would you like to collaborate on a shared farm vision with a landowner or group of like-minded people?

This guide will help you think through a few important questions, but take some time to consider them now. If you already know some of these answers, you're ahead of the game! If not, you're in the right place to find out more….

1. How can I find land?
2. What size, location,soils and type of land do I need? What features would be nice if possible?
3. What can I afford?
4. What loans are available and how do I qualify for loans?
5. What is the process for purchasing or leasing land?

How To Get Started

- Think about what you want:
  - Visit farms to find examples
  - Connect with farmers! Ask about what works for them and what doesn't. Discover different types of farmers and hear about the many ways to farm.
  - Think about what you want to do and make it real by writing it down or getting creative (Making a vision board, recording voice memos of your vision, talking to people about your vision, write a farm business plan, etc.)

- Think about what you can afford
  - List the supplies you'll need
  - List the resources you already have
  - Make a budget of your expenses and income for 1 to 3 years

- How to look for available land
  - Talk to everyone you know about your land search to see if there is land in your network
  - Check out MIFarmLink
  - Check online (zillow, realtor.com, your local land bank, facebook groups, etc.)
  - Connect with a realtor who understands your needs or specializes in ag land

- What to look for to decide if a property is the right land for you
  - Walk the property
  - Take soil samples
  - Use online maps to see if the land has flood zones, wetlands, good soil types, etc.
  - Contact the township for zoning and ordinance rules. (This can really impact what is allowed and varies from township to township)



New farmers in the MSU Organic Farmer Training Program visit a flower farm and goat dairy that share the same farmland near Greenville

Common questions for beginning farmers seeking land:

1. How can I find land in the country?
    a. MI FarmLink
    b. Online land listing websites
    c. Realtors
    d. Talking to people in your network (friends, family, neighbors, farmers, etc.)
    e. Plat map

2. How can I find land in the city?
    a. Land banks!
    b. Connecting with landowners, like businesses, non-profits, parks, etc.
    c. In some cities, zillow or realtors might be helpful. Try other routes first to lower cost or find larger or better options for your vision.

1. How can I tell if the soil and land is good for farming?
    b. In rural areas, you can use the Web Soil Survey, then a Soil Scorecard.
    c. In urban & suburban areas, testing the the soil for lead is the first step, then use an Urban Soil Scorecard..

1. What can I afford?
    c. Do you have 20% of the land price in cash for a down payment?
    d. Can you make payments of the principle PLUS INTEREST?
    e. What other expenses will you need to use the land for your farm, such as drilling a well, building a fence or building a barn or high tunnel?

2. What loans are available and how do I qualify for loans?
    c. Farm Service Agency - Low interest rates but difficult to qualify
    d. Greenstone Farm Credit Services
    e. Good Food Fund - good option if you don't qualify for FSA or Greenstone
    f. Kiva US. Loans - up to $15,000 with 0% interest - crowdfunding



Drew Farm grows on land at a Detroit Public School that was once a football field.

SECTION 1

URBAN FARMLAND

As you begin to look for farmland, think through what kind of land you need for the farm you want. Michigan has excellent examples of what an urban farm can be. Check out how farm goals and farmland weave together:

Classes, Workshops & Peer-to-Peer Learning Communities

- Edible Flint - Land is near downtown Flint, museums & public library with space for community gardens, shared growing, orchard & events.
- DP-FLI (MSU Detroit Partnership for Food Learning & Innovation) - Land includes a heated classroom, fruit plantings, permaculture.
- MSU Organic Farmer Training Program - collaborates with Detroit, Grand Rapids & East Lansing farms. OFTP doesn't have its own farmsite & benefits greatly from teaching at multiple independent farms.

Collaborative Marketing & Grower Resources

- Keep Growing Detroit -adjacent to Eastern Market, where KGD runs a collaborative market stall, called Grown in Detroit. The farmsite is set up for hosting events, gardening classes and growing transplants for 2,200+ farms & gardens in Detroit, Highland Park and Hamtramck.
- Detroit Black Community Food Sovereignty Network & D-Town Farm grows on 7 acres. Challenges like lack of electricity and water are solved with solar panels, a pond and a windmill. This economic self-determination and community interdependence is integral to their national leadership in confronting racism in the food and farm system. Their second site is the Detroit People's Food Cooperative!

Primary Considerations

- Land access through Land Bank or landowner partner organizations
- Water Access
- Neighbor support
- City regulations
- Support for urban farmers
- Breaking down barriers for farmers of color, women, farmworkers, lower-income people and others

Process for Getting Started


KEEP GROWING DETROIT'S
QUICK GUIDE TO
PURCHASING LAND FOR URBAN AGRICULTURE

1 CHOOSING A SITE

When choosing a place for your garden there are many things to consider including
- Soil type and quality (consider a test!)
- Available sunlight
- Water access
- History of dumping
- How the neighbors are using it (parking, football games, parties etc)
- Zoning (residential properties are easier to permit, more on this later!)

2 TALK TO THE COMMUNITY

Don't skip this step! Neighbors can be a gardens best advocate or worst nightmare! It will be the people living right around the garden who can provide eyes and ears on the site when you are not there. They are also in a position to complain to the city about things they don't like on your site which could result in a ticketing. The Land Bank may also reach out to them when you apply to purchase. Neighbors should be informed about what is happening and their voices should be heard. Ideally their participation is welcome in the planning and implementation of your project.

3 IDENTIFYING OWNERSHIP

The following sites are great resources to identify who owns the land currently. They will also give information like the measurements of the lot, parcel ID, zoning and last sale price.
- Regrid
- Detroit Parcel Viewer
- Wayne County Tax Assessor

4 APPLYING FOR OWNERSHIP

The process of applying for ownership will vary depending on who owns the site. This guide will focus on property owned by the Detroit Land Bank Authority (DLBA) as they are the primary owner of vacant land in the city. If a

Keep Growing Detroit's land access guide

Example land access process when working with the Detroit Land Bank:

1. Choosing a site.
2. Talk to the community.
3. Identifying ownership.
4. Applying.
5. Closing.
6. Reporting.
7. Garden permit.

Urban land access differs greatly from city to city! There is a **clear path to access land shown in these City Guides for Detroit, Highland Park, Hamtramck, Lansing and Flint**. City lots in Grand Rapids, Traverse City and Ann Arbor are rare and extremely expensive and there is no process to access vacant lots. Many other Michigan cities lie somewhere in between.

Reach out to ask about the local land access process if you have urban farmers or a non-profit working with urban gardeners and farmers in your community. If your city or town doesn't have any urban farmers or community gardens, **create your own City Guide**. You can reach out to community leaders and share your idea! If the first few people you contact are not helpful, keep trying until you find an ally in the governments, schools, not-profits, neighborhood organizations, businesses or among neigbors.



Can you grow on a parking lot? Yes! Urban Canopy Farm in Chicago answers questions from Michigan growers.

SECTION 1

COMMON QUESTIONS

01 How can I find vacant lots in my city?

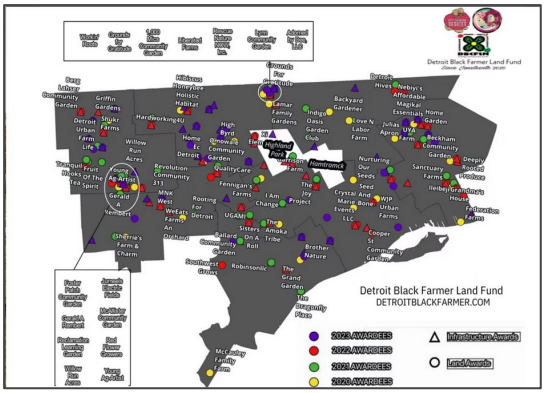
Check with the local Land Bank:

- Detroit Land Bank Authority - Activating Vacant Land
- Highland Park Land Purchase Procedures and Land Purchase Application
- Ingham County Land Bank
- Genesee County Land Bank
- Calhoun County Land Bank
- Michigan Association of Land Banks

In other regions, you can search for similar terms online:

- "zoning map for the city of _____"
- "zoning ordinance for _____ city/township"
- "change of use form for farms in _____city"
- "land bank for _____ city/township/county"
- "vacant land purchase application for _____ city"

02 What are the steps to access vacant lots?



Detroit Black Farmer Land Fund has helped farmers all over the city complete the steps to access land.

A good place to start is to look for an urban ag non-profit or BIPOC farmer land fund in your region to support you as you seek land.

After that, here is an example land access process for working with the Detroit Land Bank:

1. Choosing a site.
2. Talk to the community.
3. Identifying ownership.
4. Applying.
5. Closing.
6. Reporting.
7. Garden permit.

03 How can I connect with neighbors positively?



1. **Talk** to neighbors before starting the farm.
2. Put up **signs** to welcome people onto the farm, to explain if visitors can harvest crops and how to get involved.
3. **Welcome the community** for events, volunteering, youth programs, etc.
4. Sell or give away produce on-site or host a farmers market, food pantry of free lunch program to bring **food** into the community.
5. **Listen!** Ask for suggestions and try to follow advice of neighbors as often as possible.
6. **Be creative!** What would be appreciated in your neighborhood?

04 How can I get water?



jon kent of Sanctuary Farm in Detroit created the Detroit Water Consortium to get farmers the water they need.

It can be expensive to get water in the city… here are options to consider:

- Water catchment - add gutters to a hoophouse, a building with a metal roof or build a structure to catch rainwater.
- Use water from a neighboring home or business. A low cost hose meter can help you to pay your share of the water bill without the expense of a full water meter.
- Connect to city water with full water & sewer connection or with a "Wabash Box" to just connect to city water
- Ask the fire department about filling water totes from a fire hydrant

Food Safety - if using rainwater catchment or any water stored in a tote or container, you should use drip or put water on the soil (not edible plant parts)

Sewer charge discounts - Many cities offer a discount to gardeners so they aren't paying sewer fees for water that is absorbed into gardens

05 What regulations do I need to know about?

Zoning

- City of Detroit: Check Land Zoning and Zoning District Classifications
- Search for "zoning map for the city of _____" and "zoning ordinance for _____ city/township"

Change of Use Forms - You might need to fill out a form to garden or farm in cities, which are usually zoned 'residential' or 'commercial', rather than 'agricultural'

- "change of use form for farms in _____city"
- Detroit Change of Use Process

Mowing Enforcement - the city might have a fine for crops taller than unmowed grass. Try to find your local rules before you have a ticket.



MSU Detroit Partnership for Food Learning and Innovation

RESOURCES & PARTNERS

Urban Land Access

local Land Banks (Michigan Land Bank Association

Detroit Land Bank Authority - Activating Vacant Land

Highland Park Land Purchase Procedures and Land Purchase Application

Ingham County Land Bank

Genesee County Land Bank

Calhoun County Land Bank

Michigan Association of Land Banks

City Guides

City Guides for Detroit, Highland Park, Lansing and Flint or to create your own city guide

Urban Land Access Curriculum

https://www.beginningfarmercurriculum.org/land-access

Zoning and Regulations

- City of Detroit: Check Land Zoning and Zoning District Classifications
- Search for "zoning map for the city of _____" and "zoning ordinance for _____ city/township"

Change of Use Forms -

- Search for "change of use form for farms in _____city"
- Detroit Change of Use Process

BIPOC Farmer Land Funds

Detroit Black Farmer Land Fund https://www.detroitblackfarmer.com/

Washtenaw County Black Farmers Fund https://www.wcblackfarmers.fund/

West Michigan Farmers of Color Land Fund https://www.wmlandfund.org/

Urban Farms & Advocacy Organizations

Detroit

- Keep Growing Detroit
- Detroit Black Farmer Land Fund
- Detroit Black Community Food Sovereignty Coalition

Grand Rapids

- New City Urban Farm

Lansing

- Sunlight Gardens

Flint

- Edible Flint

Battle Creek

- Sunlight Gardens

Kalamazoo

- Zoo City Food and Farm Network

There are too many great farms to list them all....



Starting at an incubator, like the Great Lakes Incubator Farm near Traverse City, can be a first step to buying land

SECTION 2

BUYING FARMLAND

Buying a farm is a real **commitment to place and the work of farming**. This might mean living in a rural community with longer commutes to off-farm work and less contact with friends and family. If you're living on the farm, try to balance your needs for home and community, with your needs for good soil, number of tillable acres or infrastructure like a barn or fences.

Buying a farm is also a huge **financial commitment**. If you need to take out a loan, you'll want to have stable income, often from off-farm work. This protects your land, but is also essential for your mental health and well-being. You'll need to make a budget that totals your income and expenses for the farm and personal needs. Remember that INCOME MUST BE GREATER THAN EXPENSES! And you'll want to be sure you have some wiggle room to afford fun and cover emergencies.

Income
Farm Income
\+ Off-farm Income
???????

INCOME MUST BE GREATER THAN EXPENSES!

Expenses
land loan principle
land loan interest
farm expenses
personal expenses
other?
\+ unexpected costs
??????

Primary Considerations

- Affordability
- Soil quality
- Water! Are you in a flood zone? How much will it cost to drill a well?
- Access to markets
- Community: Is this where you want to live, work and/or raise children?
- Breaking down barriers for farmers of color, women, farmworkers, lower-income people and others

Process for Getting Started



Taking a soil test at the MSU Student Organic Farm

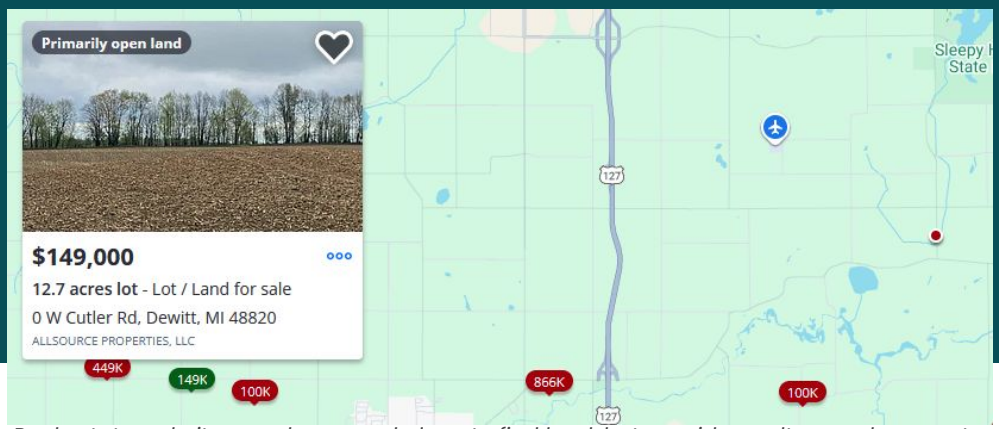
Soil Testing!

If you have a soil core sampler, like in the photo, you can push it into the soil as deeply as you till or as deep as your crop roots tend to go, usually about 4 to 6 inches deep. Be sure to remove roots, rocks and plant parts from the sample. Or contact your local Conservation District for soil sampling information.

Take 10 to 20 samples from each area you test, mix the samples together and bag up to mail to the soil test lab.

What is the timeline for buying land?

1. Consider options paying for the land. Will you use loans? Or other funds?
2. Apply for a loan.
3. Search for land in your price range.
4. Find a few options and compare them
5. Decide if your vision for your farm is a good fit for this site.
6. If you find a site, make an offer and counteroffers until you have a price.
7. Sign the loan and purchase agreement.
8. Start farming and make the payments on time!



Real estate websites can be a good place to find land, but consider realtors and your network to look for land as well. Image above is from Zillow.

SECTION 2

COMMON QUESTIONS

01 How can I find land?

You'll want to **take your time and look at a few farms in person** before deciding on a farm site that is right for you. It's also very important to **talk to your network** of family, colleagues, friends, farmers you know and any groups you participate in. You only need one piece of land, so cast a wide net as you look. You'll also want to **look online**. Working with a **realtor** can be very helpful for answering questions and sending you new listings as soon as they are posted.

Here are a few resources to help you find land:

- MI FarmLink: Find Farmland Tool - https://mifarmlink.org/find-farmland
- MI FarmLink: Make a Farm Seeker Account https://mifarmlink.org/user/register
- DNR Land Sales https://www.michigan.gov/dnr/managing-resources/real-estate/auctions-sales
- Zillow.com
- Realtor.com
- Plat maps can help you find who owns a particular property
- Michigan Association of Land Banks

Try to limit the search to your budget, location and needs. Also, beware of falling in love with a property that does not align with your vision. Without caution, this could lead you to buy in a flood zone because of a pretty stream.

02 What size, location,soils and type of land do I need?



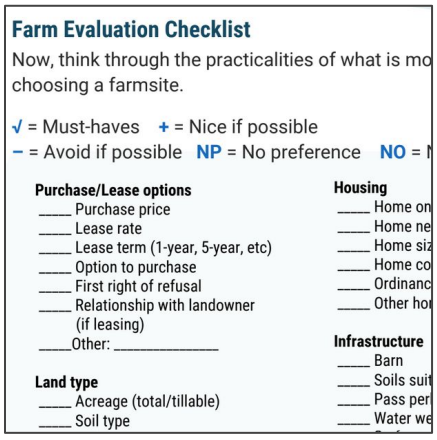
New City Urban Farm has two farmsites on Grand Rapids' NE side. They needed more acreage for the non-profit farm and are buying 5 acres (above right) through a fundraising campaign.

That depends on your farm vision!

Acreage: In general you need MORE LAND for cattle or for field crops like corn & soy. There are many small-scale vegetable farms, or pig and chicken pastures under 10 acres. There are many MICRO-SCALE farms that are just a city lot or two, which work well with herbs, flowers, vegetables and educational gardens.

Soils: The larger the farm, the harder it is to work with difficult soil types! On a smaller scale you can bring in compost, use raised beds and use no-till to manage soil problems.

03 What features would be nice if possible?



Farm Evaluation Checklist

Now, think through the practicalities of what is mo
choosing a farmsite.

√ = Must-haves + = Nice if possible
– = Avoid if possible NP = No preference NO = N

Purchase/Lease options
____ Purchase price
____ Lease rate
____ Lease term (1-year, 5-year, etc)
____ Option to purchase
____ First right of refusal
____ Relationship with landowner (if leasing)
____Other: _____

Land type
____ Acreage (total/tillable)
____ Soil type

Housing
____ Home on
____ Home ne
____ Home siz
____ Home co
____ Ordinanc
____ Other ho

Infrastructure
____ Barn
____ Soils suit
____ Pass per
____ Water we

Think through what you'd like from an **"Ideal Farmsite" and then use the Farm Evaluation Checklist** to think through what you want for your farm.

Try to remember that **no farmsite will be perfect**! And you'll find many farm sites that have some wonderful features but are missing other things that are an absolute necessity. But you only need to find ONE forever farm.

If you're growing weary and **not finding what you want**, look back to the checklist and see what you can adjust or do without.

This is a good time to have **allies who will support you** and can talk about your process.

04 What loans are available and how do I qualify for them?



Sarah Longstreth at Good Stead Farm in Hope, MI leased land and started out with an FSA Operating Microloan. After several years, she purchased the farm with an FSA Direct Farm Ownership loan.

USDA Farm Service Agency loans

--Farm Loan Discovery Tool

FSA Direct Operating Microloan - $50,000 max

Need:

- 1 Year Farm Management experience
  - OR 1 year of small business experience, Ag. internships/apprenticeships or having a mentor
- Business Plan that shows you can repay the loan

FSA Direct Farm Ownership Microloan: $50,000 max

Need:

- 3 Years Farm Management experience
  - OR 2 years farm management + 1 year equivalent (16 college credits in Ag., military leadership, business management or payment of FSA Youth Loan)
- Business Plan that shows you can repay the loan

FSA Direct Farm Ownership - $600,000 max

Need:

- 3 Years Farm Management experience OR 2 years FM + 1 year equivalent
- Business Plan that shows you can repay the loan

FSA Direct Operating Loans - $400,000 max - 1 Year Farm Management

Farm Storage Facility Loans - Microloans up to $50,000 - Loans up to $500,000

Other Loan Options

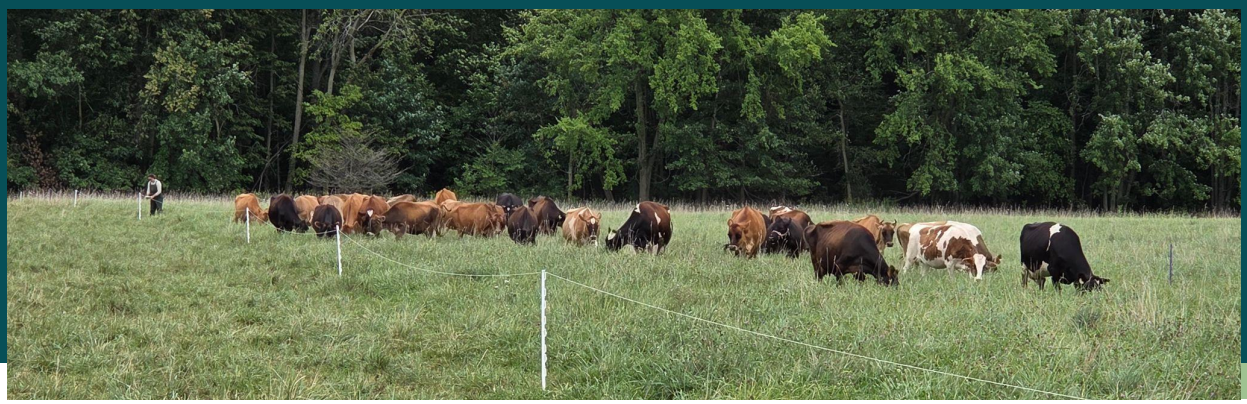
Greenstone https://www.greenstonefcs.com/loans

Good Food Fund https://migoodfoodfund.org/

Kiva U.S. Loans https://www.kiva.org/borrow

Personal Loans

Other?



Two Sparrows farm in Eaton Rapids owns 80 acres where they pasture their cattle, but they also lease land to raise hay. They have some of their beef cattle pasturing on another farmers land for a fee per head per day.

RESOURCES & PARTNERS

Buying Farmland

local Land Banks (Michigan Land Bank Association

Lenders

Farm Service Agency (FSA)
https://www.fsa.usda.gov/programs-and-services/farm-loan-programs/index

Find your local FSA office at https://offices.sc.egov.usda.gov/locator/app

Greenstone https://www.greenstonefcs.com/loans

Good Food Fund https://migoodfoodfund.org/

Kiva U.S. Loans https://www.kiva.org/borrow

BIPOC Farmer Land Funds

Detroit Black Farmer Land Fund https://www.detroitblackfarmer.com/

Washtenaw County Black Farmers Fund https://www.wcblackfarmers.fund/

West Michigan Farmers of Color Land Fund https://www.wmlandfund.org/

MI FarmLink:

MI FarmLink Michigan Land Access Info
https://mifarmlink.org/resources/land-management-and-access

Find Farmland https://mifarmlink.org/find-farmland

Find a Farmer https://mifarmlink.org/find-a-farmer

Accessing Land Together Decision Tool

https://landforgood.org/wp-content/uploads/LFG-Accessing-Farmland-Together-Decision-Tool.pdf

Land Listings and Advocacy Organizations

DNR Land Sales
https://www.michigan.gov/dnr/managing-resources/real-estate/auctions-sales

MI FarmLink

Realty Sites

Zillow.com

Realtor.com

Land Trusts & Land Conservancies:

Equity Trust https://equitytrust.org/

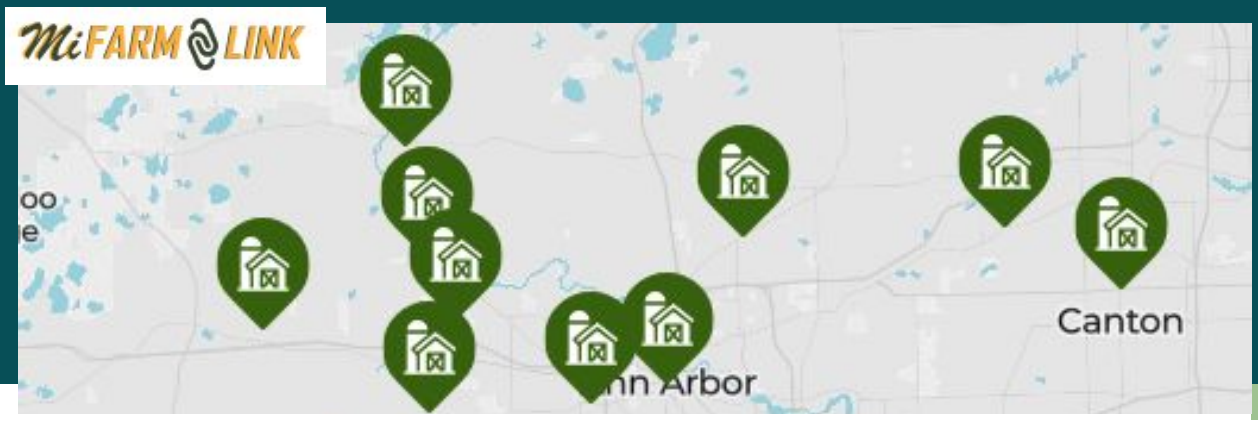
Legacy Land Conservancy (for Washtenaw, Jackson & Lenawee counties) https://legacylandconservancy.org/

Leelanau Land Conservancy https://leelanauconservancy.org/

American Farmland Trust https://farmlandinfo.org/find-farmland

Land Access Curriculum

https://www.beginningfarmercurriculum.org/land-access



Many of the listings on MIFarmLink are land for lease!

SECTION 3

LEASING FARMLAND

Leasing farmland can be very low cost! Typical rates in Michigan range from $100 to $300 per acre per year. But leasing can cost more if you're using water, electricity, a barn, hoop houses, tractors and equipment, etc.

Leasing farmland comes with real risks that you'll want to plan for ahead of time. Here are some possible challenges and solutions:

Challenges of leasing….	Solutions
Losing farmland	Writing a lease for a term or 5 or more years, or having 1st right of refusal or an option to purchase in the lease. Limit investments in infrastructure if needed.
Differences of opinion	Conversations with the landowner to ensure that your vision is in line with their expectations for the land. Include a plan for how to manage disagreements, through discussion or mediation.
Other concerns?	Figure them out before you sign your lease!

Primary Considerations

You want to make sure that this farmland is RIGHT for your vision. Ask yourself if this is all of the following:

- Right land
- Right location
- Right landowner
- Right lease agreement
- Right cost

Process for Getting Started



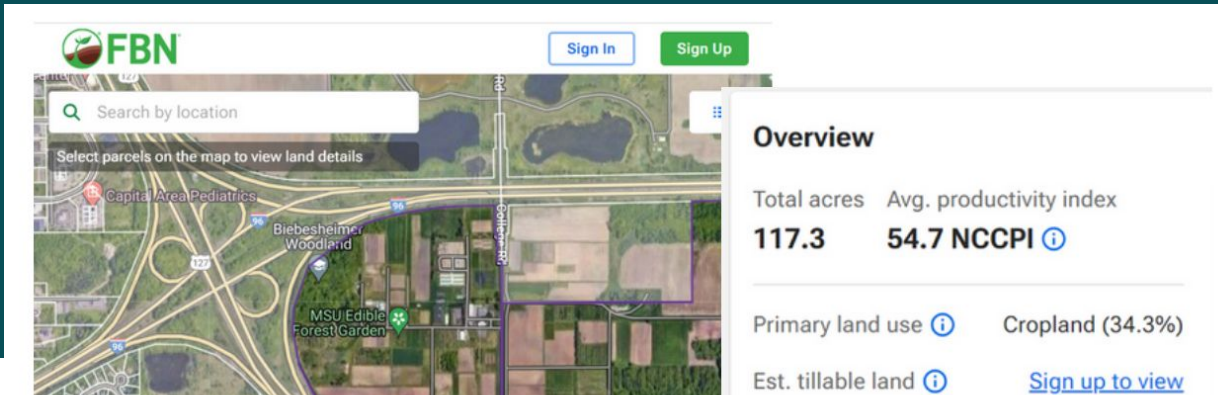
The author leased 7 acres to start her farm in 2006

1. Search for land
2. Find a few options and compare them
3. Talk with each landowner about your vision for your farm and details of the possible lease agreement.
4. Decide on which land to lease.
5. Write a lease
6. Sign the lease & start farming!

Nervous about Asking to Lease?

Leasing farmland is very common in rural areas. Over 39% of Michigan farmland is leased and people who own farmland will not be surprised to have someone ask about leasing their land.

Practice by asking a friend to role-play the conversation with you. Or you can use the Farmland Rental Negotiations guide.



Farm Business Network offers online plat maps. You can also see plat maps on some county websites, at use a printed plat map at your local library

SECTION 3

COMMON QUESTIONS

01 How do I find land to lease?

Plat maps are helpful for finding who owns land. Especially if you know where you want to farm, you can use a plat map to figure out who owns the land and then contact them about possibly leasing it.

MIFarmLink has many farms to lease. You can search the Find Farmland page to see all their listings. Or you can create your own profile so landowners can reach out to you.

Ask around! Talking to people in your network or neighborhood might know about land to lease, so share about your land search and vision for your farm with people in your circle.

Drive around! Look for land that might work for you. You can then try to call, email or phone the owner. If that doesn't work, you might even be able to knock on the landowners door and ask in person.

The author of this article heard about her farm from the farmer she worked for. She checked the plat maps, but the owner did not have a listed phone number. So she knocked on the landowners door and had a conversation. Eventually, we signed a lease with option to purchase and bought the farm a few years later….

02 How do I decide on farmland to lease? What size, location,soils and lease agreement do I need?



Cehck the FEMA Flood Zone Map!

Brainstorm your ideal farmsite and then think through what is essential and what you can do without using the Farm Evaluation Checklist from the "Ideal Farmsite" worksheet.

Check the soils through the Web Soil Survey, soil testing and visiting the site to feel the soil texture and see the soil drainage after a heavy rain.

Use maps to check if the land is in a flood zone or wetland and to find out more about your community and growing conditions. Then, make a site plan for your farm!

03 What can I afford?

ENT, CASH, CROPLAND, NON-IRRIGATED		
County	% Change 2024 → 2025	2025 $/Acre
ALCONA	92%	$62.50
ALGER	----	$25.50
ALLEGAN	----	$143.00
ALPENA	-16%	$42.00
ANTRIM	----	$42.00
ARENAC	-4%	$104.00
BARRY	6%	$122.00
BAY	-17%	$147.00
BERRIEN	0%	$152.00
BRANCH	-3%	$150.00
CALHOUN	13%	$164.00
CASS	-13%	$120.00

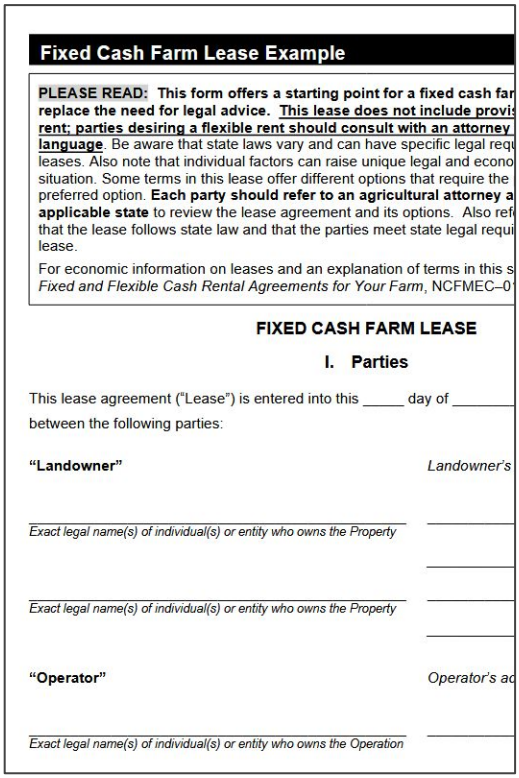
The USDA posts average farmland lease rates for Michigan counties each year.

To afford a farmland lease, you need more than the cost of the farm lease! You'll need to:

- Lease the land
- Set up needed infrastructure for water, crops or livestock
- Equipment for managing the farm
- Amend soils, plant and tend crops or pastures, harvest crops or manage livestock, etc.
- Pay your personal expenses from farm income or off-farm income

Try to be mindful of ALL your expenses before leasing a farm.....

04 How do I write a farmland lease?



Fixed Cash Farm Lease Example

PLEASE READ: This form offers a starting point for a fixed cash far replace the need for legal advice. This lease does not include provis rent; parties desiring a flexible rent should consult with an attorney language. Be aware that state laws vary and can have specific legal requ leases. Also note that individual factors can raise unique legal and econo situation. Some terms in this lease offer different options that require the preferred option. **Each party should refer to an agricultural attorney a applicable state** to review the lease agreement and its options. Also ref that the lease follows state law and that the parties meet state legal requi lease.

For economic information on leases and an explanation of terms in this s *Fixed and Flexible Cash Rental Agreements for Your Farm*, NCFMEC–0

FIXED CASH FARM LEASE

I. Parties

This lease agreement ("Lease") is entered into this _____ day of _____ between the following parties:

"Landowner" *Landowner's*

Exact legal name(s) of individual(s) or entity who owns the Property

Exact legal name(s) of individual(s) or entity who owns the Property

"Operator" *Operator's ad*

Exact legal name(s) of individual(s) or entity who owns the Operation

An example of a farmland lease

To write a farmland lease, you'll want to start by having an **in-depth conversation with the landowner** to ensure their vision for the land is the same as yours. This is not just about the cost per year! Be sure to discuss **water access, their expectations for tidiness, any use of buildings or equipment, and whether visitors would be welcome.** Decide what to do in case of a disagreement or problem (such as free mediation from Michigan Agriculture Mediation Program). Also decide whether whether a long-term lease, an option to purchase or first right of refusal are possible.

It is also important to be sure that you can maintain a good relationship with the landowner. You don't need to be best friends or even interact that often, but you'll need to be able to **trust** each other.

After conversations with the landowner, **find a good template** or example of a lease and read through it closely. There are links to farmland lease templates on the next page. Leases are often written in 'legalese', so it is smart to **underline anything that's not clear** and look up each confusing word or phrase to make sure you understand it all.

Farmland Commons has the best resources for really understanding a lease.

Once you understand the lease template, you can edit it to show what you and the landowner have agreed to. Then you can drop off the lease for the landowner to review, and they may want some revisions.

THEN! You get to sign the lease and start farming....



Hunter Park Garden House is an urban farm located in a city park on Lansing's Eastside. They are dedicated to making food available through free U-Pick and through Free Food Fridays.

RESOURCES & PARTNERS

Farmland Leasing

Farmland Leasing information

https://www.canr.msu.edu/tag/farmland-leasing

Lease Templates

https://aglease101.org/

USDA Farmland Cash Rental Rates

https://www.canr.msu.edu/resources/usda-farmland-cash-rental-rates

Farm Commons - Farmland Leasing

https://farmcommons.org/collections/farmland-and-ranchland-leasing/

Land Access Curriculum

https://www.beginningfarmercurriculum.org/land-access

Land Banks (Michigan Land Bank Association)

https://milandbank.org/

MI FarmLink:

MI FarmLink Michigan Land Access Info
https://mifarmlink.org/resources/land-management-and-access

Find Farmland https://mifarmlink.org/find-farmland

Find a Farmer https://mifarmlink.org/find-a-farmer

Incubator Farms

Farm Business Incubator (Upper Peninsula Research & Ed. Center,

Chatham)

GrowBenzie (Benzonia)

GLIF - Great Lakes Incubator Farm (Traverse City)

SEEDS Historic Barns Park (Traverse City)

Michigan Permaculture Incubator (Mt. Pleasant)

BIPOC Farmer Land Funds

Detroit Black Farmer Land Fund https://www.detroitblackfarmer.com/

Washtenaw County Black Farmers Fund https://www.wcblackfarmers.fund/

West Michigan Farmers of Color Land Fund https://www.wmlandfund.org/

General

Marketing and Selling Farm Products and Experiences



AUTHORS & INSTITUTIONS

Mariel Borgman, Community Food Systems Educator, Michigan State University Extension
Jonathan LaPorte, Farm Business Management Educator, MSU Extension
Mike Metzger, Small Ruminant Educator, MSU Extension
Jamie Rahrig, Senior Academic Specialist, Michigan State University
Samantha Stokes, former Food & Farm Business Outreach Specialist, MSU
Kable Thurlow, Beef & Grazing Educator, MSU Extension
Phil Tocco, Food Safety Educator, MSU Extension
Kendra Wills, Product Center Innovation Counselor, MSU Extension
Garrett Ziegler, Community Food Systems Educator, Michigan State University Extension

SECTIONS

Section 1: Choosing Markets
Section 2: Marketing & Selling Produce
Section 3: Marketing & Selling Livestock & Livestock Products
Section 4: Marketing Commodities
Section 5: Producing, Selling & Marketing Value-Added Products
Section 6: Marketing Experiences

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

To succeed in today's marketplace, your farm needs more than a great product—it needs a story that connects. Marketing that is accurate, compelling, and aligned with your farm's goals and values helps ensure your products and services reach the right customers and generate lasting revenue.

How to Get Started

Marketing is all about highlighting your agricultural product(s), in a way that optimizes your farm goals, resources and skills. A key aspect of marketing is choosing the market(s) where you will sell your product(s).



PRODUCTS:

The type of product(s) and scale of production strongly impacts your marketing options. Some products, such as corn, soybeans, dry beans and large scale livestock production, are suited for the commodity market while others like diversified vegetables, orchard crops, cut flowers and small-scale livestock benefit from direct, intermediated and wholesale markets. It is important to understand that direct, intermediated and wholesale markets vary widely and might include farmers markets, wholesale cooperatives, produce brokers, community supported agriculture (CSA) shares, restaurant sales, institutional sales, retail (on-farm, consignment, co-op or grocery) and more. It's crucial to research these different markets to find out which are the best match for your scale, products and profit margins. For example, within the greater umbrella of wholesale markets, there are unique channels to serve differences in scale and product quality:

- a small scale vegetable farm may not meet the quantity of production needed to sell through a produce broker, but may find success selling in bulk to a food hub
- selling to a processor may be a great option for "seconds," produce that is small, misshapen or blemished, that may be rejected by retail produce buyers

Farm marketing can involve selling services and experiences in addition to products. Services could include things like custom processing, farm tours, educational offerings, etc. Experiences could include things like workshops, farm dinners, farm stays, or agritainment such as corn mazes, etc.

FARM GOALS & VALUES:

Your farm goals and values will also shape the markets you choose. Some examples for considerations include:

- **Financial**

  What is your financial goal for your farm/this product: to break even, to make a profit, to make a living, to be able to farm full time, to pay off debt, to afford an expansion of the business, etc. The amount of revenue you need to bring in will vary depending on where and how you market your product.

- **Personal**

  Consider how marketing will affect your "work-life balance". Is farming your full time job? Do you have a day job too? What about family obligations and incorporating time for travel, an "off" or slower season?

- **Social**

  Do your farm values and goals incorporate explicit social issues such as the desire to support your local community, buy from other local businesses, offer options for healthy food access, or provide educational opportunities?

- **Environmental**

  Consumers are currently very concerned about the environmental impact of their choices. Communication of your sustainable growing practices and the advertisement of certifications such as MAEAP, Certified Naturally Grown, Certified Organic, Animal Welfare Approved, etc. can often be a value-add that customers will pay extra for, and should play a large role in how and where you market your product(s).

RESOURCES & SKILLS:

It is important to acknowledge that marketing activities incur associated costs like time, that must be factored into your financial planning. All entrepreneurs, but especially farmers, tend to undervalue their own time. When it comes to marketing, sharing the story of a product you're proud of can be enjoyable, but it's easy to forget that the effort still costs time and money that could have been spent elsewhere.



Therefore, farms should periodically consider their marketing efforts and evaluate whether they are useful investments or if changes need to be made. It is also important to remember that targeted investment in contracted professional marketing services such as website builds, social media work, farmers market staffing, etc. may be a more efficient use of resources than the farm owner/operator doing all of that work themselves.

Each market channel requires a specific combination of skills and resources. For example, selling at a farmers market may require licensing, early mornings, long days of face-to-face interactions, staff time and travel, stall fees, retail displays, and often accepting varied forms of payment (credit cards, **EBT**, **Double up food bucks, etc.**). Additionally, there are risks involved in every market. Continuing with the farmers market example, factors such as bad weather can significantly affect daily sales in addition to the inherent risks of farming such as crop failure, pest pressure, drought, etc.



One way to mitigate risks is market diversification: select a few different outlets that are a good fit for your product so that even if one fails, you have other options to still bring in revenue. Lastly, it is important to understand that every market comes with unique costs and benefits, and that picking the right one for your product means balancing the tradeoffs.

For example, your product might fetch a higher price at a farmers market, but your staff and travel expenses will also be higher when compared to selling through an intermediary or wholesale market which, despite bringing in less revenue per unit, can often move a higher volume and will assume the cost of overhead, staffing, etc.

REGULATIONS THAT PERTAIN TO MARKETING:

All food and beverage products (even similar items) may have different regulations depending on what ingredients are used, the location or facility in which it is being produced, how the product is processed, the packaging materials used, the distribution or shipping methods, as well as a variety of other factors. Licensing and regulation for food and beverage production in Michigan is administered by:

- Local Health Departments
- Michigan Department of Agriculture and Rural Development (MDARD)
- U.S. Department of Agriculture (USDA)
- U.S. Food and Drug Administration (FDA)
- Local zoning ordinances
- Michigan Department of Environment, Great Lakes and Energy (EGLE)



SECTION 1

CHOOSING MARKETS

Primary Considerations

- Products
- Skill sets
- Staff capacity (time to devote to marketing activities)
- Regulations
- Financial goals



Process for Getting Started

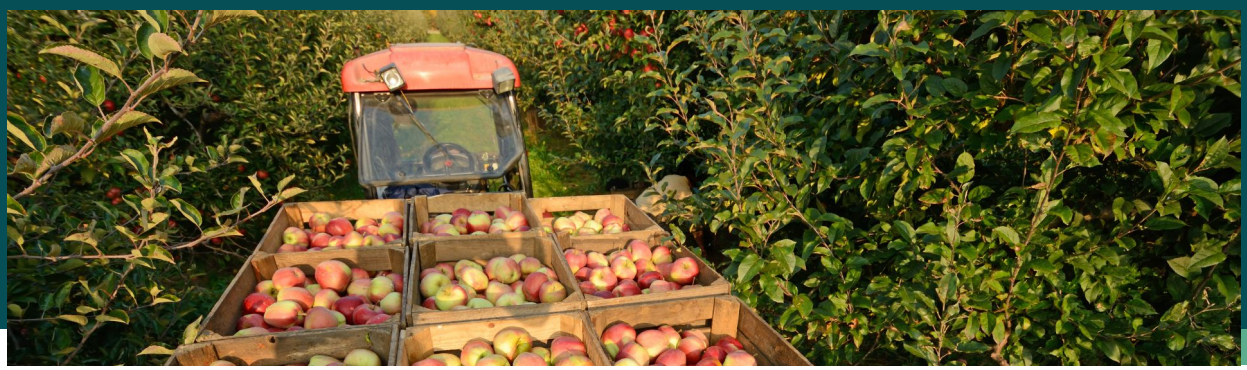


Research the different types of markets available. Talk to other farmers about where they sell their goods. Ask if there are any markets they've tried in the past that they have stopped selling into and why they moved away from them. Consider any regulations, certifications, licenses, insurance or other requirements that markets may have.

Consider the capacity, skill sets and interests of those who will be involved in marketing your product(s). If you are a very small farm, there may be only one or two people responsible for managing sales and marketing activities and those individuals may also have production responsibilities to balance.

Also consider the financial goals for your business. Product pricing varies depending on the market. In general, markets that buy large volumes of product will pay a lower price per unit, but you'll sell many units. Selling directly to consumers will get the best price per unit, but you'll typically sell fewer units.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 1: CHOOSING MARKETS

COMMON QUESTIONS

01 What are the regulations for selling my product(s)?

Regulations differ depending on what you are selling and where you want to sell it. Different agencies regulate agricultural sales, depending on the product, how it is processed and where it is sold. These agencies include:

- local health departments
- local planning and zoning departments
- Michigan Department of Agriculture and Rural Development (MDARD)

and federal agencies including:

- United States Department of Agriculture (USDA)
- Food and Drug Administration (FDA)

The **Selling Food In Michigan Quick Reference Guide** is a good starting point for exploring regulations around food products.

02 Where can I sell my product?

Deciding which market(s) to sell into requires a good understanding of the product(s) you have to offer, your financial goals, and the skills of those who will be involved in marketing and selling your products, in addition to the customers you hope to reach.

If you are looking to sell commodities, generally you'll be selling into a single market. ***More specifics about commodity marketing can be found in section 4 of this chapter.***

For other types of products, there are many different options and each potential market has a unique set of considerations. Some farms sell into a single market and others will distribute their sales across multiple markets. Many farms that sell to multiple markets will change their markets over time as they find which work best for their business throughout its lifecycle. Many beginning farmers will start with a single market and expand into new markets. A market channel selection tool, such as the one shown, can be helpful in comparing various markets.

Minimum Expectations & Considerations for Entry into Various Market Channels[1]

MARKET CHANNEL CONSIDERATION	FARMERS MARKET		FARM STAND		CSA		SMALLER FOOD HUB ($1–5 MILLION IN SALES)		RESTAURANT OR INSTITUTION		LARGER GROCERY		LOCAL/REGIONAL PROCESSOR		DISTRIBUTOR & LARGE FOOD HUB	
FARM CHARACTERISTICS																
Farmer Experience	Low	1	Low	1	Medium to High	4	Medium	3	Medium	3	High	5	Medium	3	High	5
Production Capacity	Low	1	Low to Medium	2	Low to High	3	Medium to High	4	Low to Medium	2	Medium	3	High	5	High	5
Mechanization/Systematization	Low	1	Low	1	Medium	3	Medium	3	Medium	3	Medium	3	High	5	High	5
Access to Land	Low to Medium	2	Low to Medium	2	Medium	3	Low to Medium	2	Medium	3	Medium to High	4	High	5	High	5
MARKETING/ADVERTISING																
Farm/Brand Visibility	High	1	High	1	High	1	Medium to High	2	Low to Medium	4	Low to Medium	4	Low	5	Low	5
Face-to-Face Interaction & Presence	High	1	Medium to High	2	High	1	Low	5	Medium	3	Low	5	Low	5	Low	5
Persistent Follow-Up Needed	Low	1	Low	1	Low to Medium	2	Medium	3	Medium to High	4	Medium	3	Low to Medium	2	Medium	3
PRODUCT CHARACTERISTICS																
Product Diversity	High	1	High	1	High	1	Low to Medium	4	Low to Medium	4	Low to Medium	4	Low	5	Low	5
Food Safety Requirements	Medium	3	Medium	3	Medium	3	High	5	Medium to High	4	Medium to High	4	High	5	High	5
Product Consistency Needed	Medium	3	Medium	3	Low to Medium	2	Medium to High	4	Medium to High	4	High	5	Medium	3	High	5
PRICING																
Setting Product Prices	High	1	High	1	Medium	3	Medium to High	2	Low to High	3	Low to Medium	4	Low	5	Low	5
Price Point	High	1	High	1	Medium	3	Medium	3	Medium	3	Medium	3	Low	5	Low to Medium	4
FARM LOCATION																
Access to 100,000+ Population	Very Important	1	Very Important	1	Very Important	1	Not Important	5	More Important	2	Less Important	3	Not Important	5	Not Important	5
LABOR																
Sales Labor Needs	High	1	Medium	3	Low to Medium	4	Low	5	Low	5	Low	5	Low	5	Low	5
TOTALS		11		13		17		28		25		28		33		34

Detailed discussion of these various market channels (farmers market, CSA, restaurants, retail, etc.) are also found in *Pathways to $100K in Farm Sales*, also published as part of this series.

Portions borrowed or adapted from *Guide to Marketing Channel Selection* (2010), Cornell Cooperative Extension, p. 34.

Chart from Cary, T. (2017). Market channel selection tool. East Lansing, MI: Michigan State University Center for Regional Food Systems. Retrieved from foodsystems.msu.edu/resources/market-channel-selection-tool

The **Beginning Farmer Curriculum Marketing Modules** have a series of activities that can guide beginning farmers through this process:

Activities in Module 1 - What Am I Marketing & What Are My Skills?

- Consider Your Face-to-Face Customer Time
- Assess Your Customer Base
- Assess Your Products

Activities in Module 2 - What Are My Marketing Options?

- Consider Farmers Markets
- Consider Online Sales
- Consider Wholesale Sales
- Consider Operating a CSA
- Consider a U-pick Operation
- Rank Your Top Choices

Detailed product-specific marketing and sales information can be found in the additional sections of this chapter:

- **Section 2:** Marketing and Selling Produce
- **Section 3:** Marketing and Selling Livestock and Livestock Products
- **Section 4:** Marketing Commodities
- **Section 5:** Producing, Selling and Marketing Value-Added Products
- **Section 6:** Marketing Experiences

03 How do I know what price to charge?

In some cases, such as commodity markets, the market will set the price. In other cases, such as one's own farm market, the farm can set any price they would like. In yet other cases, there may be conversations involved about what the buyer is willing to pay and what the farm needs to charge. The product-specific sections of this chapter include specific pricing guidance, but the following general guidance applies to all:

- Keep farm records to know your costs of producing the product(s), including the time spent on farm management and marketing activities.



- Research your market(s) to understand pricing trends
  - USDA Agricultural Marketing Service provides reports at **https://www.ams.usda.gov/services/market-research**
  - Michigan Small Business Development Council (SBDC) offers free market research services at **https://michigansbdc.org/our-services/market-research/**

04 How do I market my product?

While detailed product-specific marketing strategies can be found in the additional sections of this chapter, the following recommendations apply to all types of farm businesses.

Put your best foot forward.

Great customer service leads to satisfied customers who tell their friends. The bulletin **Customer Service Basics for Agricultural Entrepreneurs** from Oklahoma State Extension provides an overview of considerations. The way that you present yourself, your farm, and your products can make an important impression on customers.

Plan for Marketing Expenses

Don't overlook the expenses of marketing, both time and money, when developing your farm budget. Potential marketing expenses could include:

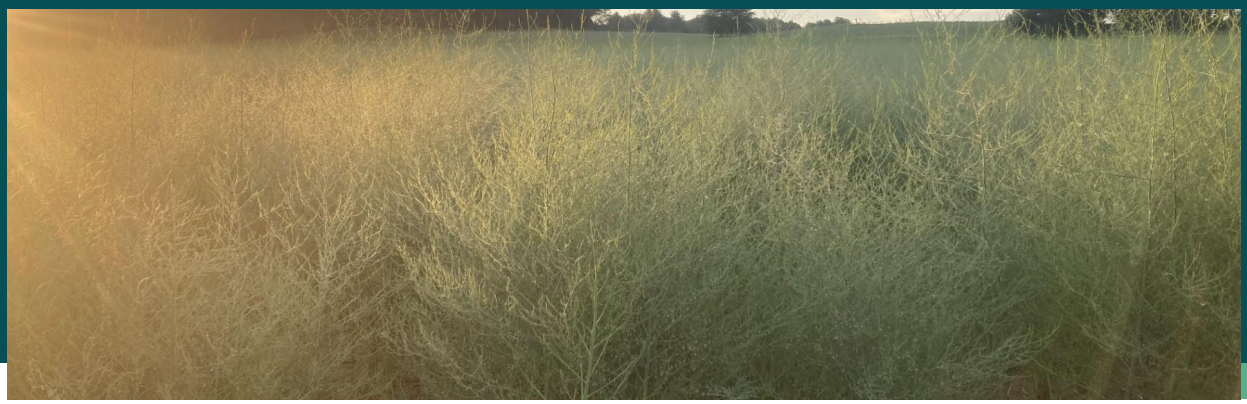
- Time spent on market research, talking with potential customers, building and updating the farm website and social media, etc.
- Cost of web domain and hosting, email marketing software, etc.
- Paid advertising, such as in local newspapers, directories, direct mailings, etc.

05 How can I learn more about my customer(s)?

Here are some resources that outline different strategies for learning more about your ideal customer(s), sometimes called your "***target market***".



- **Marketing Research Basics: Identifying Your Target Market** article from Penn State Extension
- Tips for learning about potential customers from MSU Extension: https://www.canr.msu.edu/news/in_search_of_marketing_data



RESOURCES & PARTNERS

Necessary Resources

- **USDA Farmers.gov How to Start a Farm: Sell Your Products:** (https://www.farmers.gov/your-business/beginning-farmers/sell-your-products)
- **Selling Food In Michigan Quick Reference Guide**
- **Beginning Farmers Marketing Curriculum Modules:** https://www.beginningfarmercurriculum.org/marketing
- **Market Channel Selection Tool from the Toolbox for Vegetable Farm Viability:** https://www.canr.msu.edu/resources/market-channel-selection-tool
- **MSU Farm Business Management - Commodity Marketing (msu.edu):** (https://www.canr.msu.edu/tag/commodity-marketing)
- **USDA Agricultural Marketing Service provides reports at:** https://www.ams.usda.gov/services/market-research

- **Michigan Small Business Development Council (SBDC) offers free market research services:** https://michigansbdc.org/our-services/market-research/
- **Customer Service Basics for Agricultural Entrepreneurs:** https://extension.okstate.edu/fact-sheets/customer-service-basics-for-agricultural-entrepreneurs.html
- **Marketing Research Basics: Identifying Your Target Market:** https://extension.psu.edu/marketing-research-basics-identifying-your-target-market
- **Tips for learning about potential customers from MSU Extension:** https://www.canr.msu.edu/news/in_search_of_marketing_data

Educational Programs & Events

- **Local Food Marketing 101 presentation - available by request from MSU Extension Community Food Systems**

Partners

- **Michigan Department of Agriculture and Rural Development:** https://www.michigan.gov/mdard
- **Michigan Farmers Market Association:** https://mifma.org/
- **Michigan CSA Network:** https://www.michigancsanetwork.org/
- **Michigan Farm to Institution Network:** https://www.canr.msu.edu/michigan_farm_to_institution_network/
- **Taste the Local Difference:** https://www.localdifference.org/
- **Michigan MarketMaker:** https://mi.foodmarketmaker.com/
- **Michigan Agritourism Association:** https://www.michiganfarmfun.com/
- **MSU Product Center:** https://www.canr.msu.edu/productcenter/



SECTION 2

MARKETING & SELLING PRODUCE

Primary Considerations

- Volume
- Postharvest handling (produce safety, wash/pack, packaging, refrigeration/cold chain, etc.)
- Quality/grade (fresh or processing)
- Variety (growing niche crops or basics, growing many things or a few, etc.)
- Telling your story (advertising, signage, display, labels, certifications, etc. as appropriate to market channel)



Process for Getting Started

STEP 1

Create a marketing plan. Decide where and how you would like to sell your produce (*refer to Section 1- Choosing Markets*). **AgPlan** is a free business planning software that can help you build a marketing plan for your farm business.



STEP 2

Build your crop plan accordingly:

Resources for annual crops

- Selecting and purchasing seeds and transplants (See the *Seeds* and *Transplants & Grafting* sections of this guide)
- **Scheduling Vegetable Planting for Continuous Harvest** from National Sustainable Agriculture Information Service (ATTRA)
- **Crop Scheduling for Continuous Harvests and Planning Spreadsheets for CSAs and Farmers Markets** from NC State Extension

Resources for perennial crops

- Selecting and purchasing pieces of roots, stems, or bulbs (See the *Transplants & Grafting* sections of this guide)
    - **Plant Spacing Calculator**
    - **Understanding and Choosing the Right Apple Rootstock**
    - **Establishing an Apple Orchard**
    - **Blueberry Varieties for Michigan**
    - **Raspberry Varieties for Michigan**
- **Planning and Planting an Orchard** from Penn State Extension Beginning Grower

Additional crop planning resources can be found in the Business Planning Chapter, section 1 under Operations: Crop & Production

STEP 3

Make a plan for harvest and post-harvest handling (washing, packaging, etc.) that meets the needs of your markets. Refer to your crop plan and/or seed packets and catalogs to determine when crops will be ready for harvesting.

- **Post harvest handling resources for vegetable and fruit growers**
- **Post harvest sanitation, on farm food safety resources**

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 2: MARKETING & SELLING PRODUCE

COMMON QUESTIONS

01 What are the regulations for selling produce in Michigan?

Whole fresh fruit and/or vegetables that have not been cut do not require a license to be sold to consumers. Many farms must comply with federal produce safety regulations. Determine if your farm is covered by using this tool from MSU Extension: **https://www.canr.msu.edu/resources/am-i-covered** and learn more about produce safety in Question 3.

Processing vegetables in any way, such as cutting, canning, freezing, etc. will usually require a license issued by the **Michigan Department of Agriculture and Rural Development (MDARD)**.

02 Do I need to wash my produce before selling it?



No. In some cases, washing might decrease the shelf life and increase the risk of food poisoning from your product. Some products like soft berries rot more quickly once they are washed.

To start with, don't pick produce with poop on it. Once on the produce, poop can't be washed off enough to make a real difference in safety. In trying to wash poop off, you may end up spreading poop residue to other produce, too. Leave any produce with bird poop, deer poop or other fecal material in the field. After you're done harvesting, remove these products and throw them out. Be sure to wash and sanitize all equipment that came in contact with poopy produce thoroughly before using it for food again.

The less dirt on your produce in the first place, the less need there will be to wash it. Reduce the potential for dirty produce by using mulch to reduce soil contact for some crops. When practical, trellis crops like beans, cucumbers, tomatoes and others. Less dirt on the crop means less dirt you need to worry about.

Some crops DO benefit from washing. Root vegetables in particular need a lot of moisture in storage and will store better if rinsed with water prior to storage. The added moisture keeps the humidity in storage crates higher. Rinsing root vegetables right after harvest removes more dirt than if it's allowed to dry on the surfaces.

03 Do I need food safety certification?

Whether you need third party verification or formal certification of your farm's food safety practices depends on your market(s). Many wholesale markets will require third party food safety certification. Smaller, local and regional wholesale markets may require a written food safety plan and/or a farm visit. Whether or not your market requires certification, all farms that grow produce should be familiar with basic on farm produce safety practices and whether their farm is covered under the Food Safety Modernization Act (FSMA) Produce Safety Rule regulations.

Michigan On Farm Produce Safety offers free and confidential on farm produce safety education and resources.

MSU Extension's Agrifood Safety Website has many resources for farms about on farm food safety practices.



MSU Extension has a virtual tool to help you find out if your farm is covered by federal produce safety regulations: **Food Safety Modernization Act (FSMA) "Am I covered?".**

04 How do I reach potential customers?

Advertising and promotion are particularly important for direct to consumer sales, but can be useful for wholesale and intermediated markets as well. Refer back to section one for resources on how to identify your target customer audience, and consider using these guiding questions:

- Who is my target customer?
- What are their values?
- What needs and wants could my product fulfil for them?

What value do you add to the customer's buying experience beyond the product itself? Examples could include great customer service, solving a problem, meeting a need, providing an experience, etc.

Once you have this information, it's time to connect! There are **digital**, **print** and **face-to-face** opportunities:

Digital Marketing

- Farm website
- Email marketing
- Google Business profile
- Local food & farm directories
- Social media

Print Marketing

- Flyers at local businesses
- Direct mailings to area households
- Advertisements or guest columns in local newspapers

Face-to-Face Marketing

- Visit chefs, local grocery stores, etc.
- Talk to customers at farmers markets
- Attend meet-the-buyer events

05 How do I know what price to charge?



Farms selling directly to consumers have the advantage of setting their own price. Ideally the price should factor in all the costs of doing business, including inputs and labor, as well as a profit margin. If you are selling in a farmers market, you should be priced competitively with other farms with similar quality and production practices.

If you're priced too low, it can undercut sales to other farmers and be damaging to the market as a whole. If you're priced too high, customers will shop elsewhere. Market prices can vary based on zip code, so visiting a variety of markets and comparing pricing as part of your market research can be helpful.

When pricing products in the wholesale market, the grower should keep the marketing cost incurred by the buyer in mind. Marketing costs on behalf of the buyer vary widely, but a good benchmark is 30% of the final consumer price. So, if the final consumer price is typically $5 for a bunch of local carrots, $1.50 is spent on marketing.



For growers transitioning into this market type from direct to consumer markets, try reducing your retail price by 30%. If you are a small-scale grower, communicate the added value you bring (freshness, taste, quality, local brand, flexible delivery, etc.) to compensate for the potentially higher price of products compared to much larger scale producers. Wholesale buyers typically purchase produce by the case rather than by the item. Providing a pricing sheet that lists your items by the case will be helpful when talking to buyers. Case-size pricing can be calculated by multiplying the number of units by their retail price and reducing that figure by 20–30% to account for the wholesale nature of the transaction.

Here are some resources that may be helpful in determining how to price your products:

- Oregon State Extension Bulletin: **How Much Can I Charge for My Farm Products**
- **Effective Pricing Methods for Produce at Farmers Markets** article from Penn State Extension
- Factsheet from Cornell Small Farms Program: **Finding Price Information**



RESOURCES & PARTNERS

Necessary Resources

- **Marketing Fresh Produce via Direct to Consumer and Intermediated Markets**
- **Beginning Farmers Marketing Curriculum Modules:** https://www.beginningfarmercurriculum.org/marketing
- **Market Channel Selection Tool from the Toolbox for Vegetable Farm Viability:** https://www.canr.msu.edu/resources/market-channel-selection-tool
- **Marketing Fresh Produce via Direct to Consumer and Intermediated Markets:** https://www.canr.msu.edu/resources/bulletin-e-3424-marketing-fresh-produce-via-direct-to-consumer-and-intermediated-markets
- **NCAT Marketing Tipsheet Series - Tips for Selling to Produce Brokers:** https://attra.ncat.org/publication/tips-for-selling-to-produce-brokers/
- **NCAT Marketing Tipsheet Series - Tips for Selling to Aggregators/Grower Marketing COOPS:** https://attra.ncat.org/publication/tips-for-selling-to-aggregators-grower-marketing-coops/

Marketing Plan Resources:

- **AgPlan Software and AgPlan Marketing Plan Tutorial**
- **Agricultural Business Digital Marketing Plan** from University of Vermont Extension

Crop Planning Resources:

- **Scheduling Vegetable Planting for Continuous Harvest** from National Center for Appropriate Technology's ATTRA Sustainable Agriculture Program
- **Crop Scheduling for Continuous Harvests and Planning Spreadsheets for CSAs and Farmers Markets** from NC State Extension
- **Planning and Planting an Orchard** from Penn State Extension Beginning Grower

Food Safety and Regulatory Resources:

- **Good Agricultural Practices** information from MSU Extension
- MSU Extension **Agrifood Safety Website**
- **Michigan On Farm Produce Safety** program website
- **Food Safety Modernization Act (FSMA) "Am I covered?"** tool from MSU Extension
- **Does Your Business Qualify? List of Food Licence Exemptions** from the Michigan Department of Agriculture and Rural Development

Post Harvest Handling Resources:

- General:
    - **Post Harvest Handling Resources** for Vegetable and Fruit Growers from MSU Extension
    - **Post Harvest Sanitation and Food Safety** from MSU Extension
    - **Beat the Heat in Postharvest Handling** an article from Growing for Market that discusses strategies for reducing and removing field heat to improve quality and food safety
- For Wholesale Markets:
    - **Wholesale Success: A Farmer's Guide to Food Safety, Selling, Postharvest Handling and Packing Produce**
    - **USDA AMS Grades and Standards for Vegetables**
    - **USDA AMS Grades and Standards for Fruits**

- **Farm Branding: Selling Your Products Through Story** from National Center for Appropriate Technology's ATTRA Sustainable Agriculture Program
- **Marketing & Promotions Resources** from Taste the Local Difference
- **Farm Certification Options** from MSU Extension
- **Sell More! Farmers Market Vendor Booth Guide** from Washington State University Small Farms Program
- **Growing Michigan's Future: A Guide to Marketing Your Michigan Food and Agriculture Products** from Michigan Department of Agriculture and Rural Development
- **How Much Can I Charge for My Farm Products** bulletin from Oregon State Extension

- **Effective Pricing Methods for Produce at Farmers Markets** article from Penn State Extension
- **Finding Price Information** Factsheet from Cornell Small Farms Program

Digital Marketing Resources:

- **How to Create a Google Business Profile**
- **How to Pick an Email Marketing Platform** from Community Alliance with Family Farmers
- **7 Simple Steps for Creating a Website** from Community Alliance with Family Farmers
- **10 Tips for Farm Social Media** from Land-Grant Press by Clemson Extension
- **My Digital Farmer Podcast**

Educational Programs & Events

- Local Food Marketing 101 presentation - available by request from **MSU Extension Community Food Systems**
- CSA Innovation Network **Ideas Lab**
- Michigan Farmers Market Association **Farm Based Education Program**
- Taste the Local Difference **Local Food Marketing Academy**

Partners

- Michigan Farmers Market Association: https://mifma.org/
- Michigan Farm to Institution Network: https://www.canr.msu.edu/michigan_farm_to_institution_network/
- Michigan CSA Network: https://www.michigancsanetwork.org/
- MarketMaker: https://mi.foodmarketmaker.com/
- Taste the Local Difference: https://www.localdifference.org/
- Michigan On-Farm Produce Safety: https://www.miofps.org/
- Michigan Department of Agriculture and Rural Development: https://www.michigan.gov/mdard



SECTION 3

MARKETING & SELLING LIVESTOCK & LIVESTOCK PRODUCTS

Primary Considerations

Decide which products you wish to market. These all have different requirements for marketing.

- Animals for slaughter or meat products
- Breeding stock animals
- Dairy products
- Fiber products
- Eggs

Process for Getting Started

Livestock products can be marketed many different ways. Both small and large producers can take advantage of public auctions to sell livestock for slaughter purposes. Animals can be marketed directly from the farm whether for slaughter or breeding stock purposes. Animals sold for slaughter purposes must be sold live and the purchaser processes the animal.



If producers plan to sell cuts of meat, whether from the farm or at farmers markets, the animal must be processed at a USDA inspected processing plant and other licensing may be required. The producer must also have the appropriate licensing from MDARD.

Dairy products require special licensing through the Michigan Department of Agriculture Dairy Division. Shares may be an option for Dairy products as well.

Eggs can be marketed by small producers as long as they are producing the eggs and not purchasing them for resale. Large egg producers are required to be licensed and have a licensed egg washing facility.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 3: MARKETING & SELLING LIVESTOCK

COMMON QUESTIONS

01 Can I sell milk or dairy products using the Michigan Cottage Food Law from a farm stand or at a farmers market?

No, in order to sell milk or dairy or dairy products, the milk must be produced at a licensed dairy and processed in a licensed processing plant.

02 Can I sell frozen cuts of meat from a farmstand or at a farmers market?

In order to sell fresh or frozen cuts of meat at a farmers market or from a farm stand the animal must be processed at a USDA inspected facility and the producer must have a food warehouse license from the Michigan Department of Agriculture and Rural Development.

03 Can I sell eggs to my neighbor or at a farm stand?

As long as you have under 3,000 hens and you own them (are not buying eggs for resale) you can sell eggs at a farmstand/farmers market. Other labeling requirements may need to be met for farmers markets.

04 Can I sell live animals off the farm for slaughter?

A live animal can be sold to the public off the farm and then processed however or wherever the purchaser decides.

05 Can I sell venison?

In order to sell venison it must be processed and inspected at a licensed facility, or purchased from a licensed game ranch. Hunter harvested venison must be kept for personal use and marked as not for sale.



RESOURCES & PARTNERS

Necessary Resources

- **Producing Shell Eggs: Less than 3,000 laying hens** factsheet from MSU Center for Regional Food Systems
- **Producing Shell Eggs: Greater than 3,000 laying hens** factsheet from MSU Center for Regional Food Systems
- **Becoming a Michigan Licensed Shell Egg Operator** from Michigan Department of Agriculture and Rural Development
- **Selling Farm Fresh Poultry in Michigan** factsheet from MSU Center for Regional Food Systems
- **Selling Farm Fresh Meat in Michigan** factsheet from MSU Center for Regional Food Systems
- **Meat Marketing and Processing** resources form MSU Extension

Educational Programs & Events

- Small Scale Poultry Farming Online Course, includes marketing module: https://www.canr.msu.edu/courses/small-scale-poultry-farming-online-course
- Recorded webinar - Selling Farm Fresh Meat in Michigan: https://www.canr.msu.edu/videos/selling-farm-fresh-meat-in-michigan

Partners

- Michigan Department of Agriculture and Rural Development: https://www.michigan.gov/mdard
- Taste the Local Difference: https://www.localdifference.org/



SECTION 4

MARKETING COMMODITIES

Primary Considerations

- Cost of Production
- Difference between futures prices, cash prices, and basis
- Market environment
- Pricing decision tools
- Market planning

Process for Getting Started

Knowing what costs went into producing the grain is the first step in getting started in grain marketing. Identifying your cost of production requires good, accurate details in your farm records. It also requires an understanding of what costs should be included in establishing a minimum price.



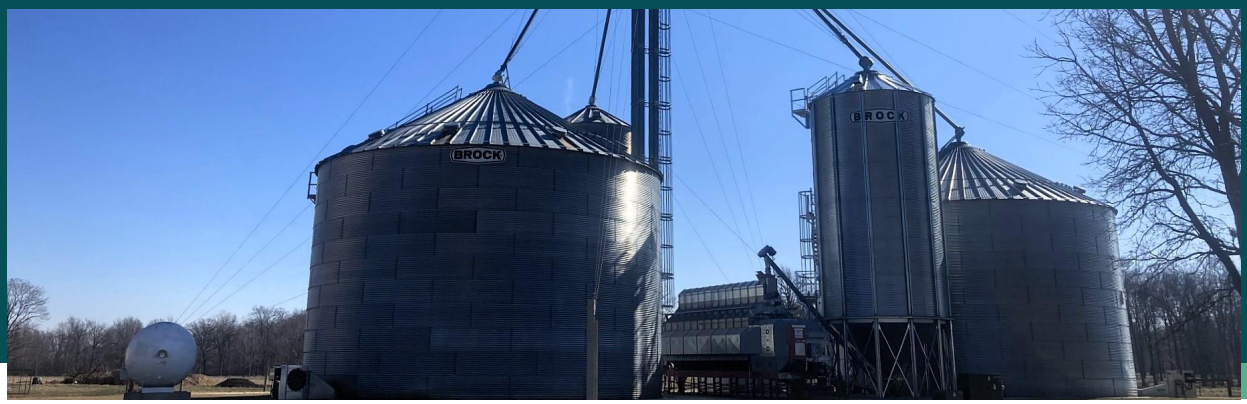
Understanding the relationship between futures prices, cash prices, and basis in the market environment is the next step in pricing your grain. Understanding pricing patterns between futures, cash, and basis is important to determining when the best prices typically are available. You can use pricing patterns to provide target periods to help you evaluate your decision options.

Once you begin to understand the market environment, consider which pricing tools may be beneficial to your pricing goals. Pricing decision tools can help to mitigate the risks that prices move in opposite or unfavorable directions for your farm. In some cases, you can use multiple decision tools together to provide the best protection against risk.

The components of market prices, market environment and even pricing tools may be simple to understand once you are familiar with them. However, marketing involves a lot of unknowns every year. Those unknowns can mean that decisions you make are not 100% guaranteed to secure a profitable price. But don't let perfect be the enemy of the good! Pay attention to trends and make a marketing plan that uses a few different marketing tools. These two simple rules can help you better manage your risk and improve your chances of locking in profitable prices.

Disclaimer. For a specific list of resources in the above description, view the Necessary Resources area of this section.





SECTION 4: MARKETING COMMODITIES

COMMON QUESTIONS

01 What is the difference between futures prices, cash prices, and basis?

Think of the futures price as the world price for each commodity in the market. Most farms don't sell grain directly on the futures market but rather at a local, domestic location (grain elevator, processor, etc.). The local price is called the cash price. The difference between the cash price and futures price is called basis. Basis is set by the local market and is essentially a fee charged for transportation, storage and interest costs. It can also be influenced by local supply and demand.

02 How do I know what a "good price" is?

One of the most common misconceptions is that a good price is the highest price the market will offer. Pursuing the highest price can be harmful to your farm, especially if markets are experiencing volatility; where prices can move up or down very quickly. Finding a "good price" involves having a clear understanding of your farm's cost of production. Knowing what costs went into production establishes a minimum or break-even price that must be met.

Every farm differs in how it produces grain and operates the business. This difference means that your cost of production and minimum price will be different from your neighbor's. Identifying your cost of production requires good, accurate details in your farm records to ensure all of your costs are included.

For more information on cost of production, review the MSU Bulletin E-3411: Introduction to Cost of Production and Its Uses at https://www.canr.msu.edu/resources/bulletin-e-3411-introduction-to-cost-of-production-and-its-uses.

For forage growers, also review: https://www.canr.msu.edu/resources/marketing-and-pricing-standing-hay

03 When is the best time to sell?

Although the market can be volatile and risky at times, patterns or trends can be seen year after year. Understanding pricing patterns is important to determining when the best prices typically are available.To understand these patterns or trends, start by learning about your crop's marketing season. You can use this understanding of pricing patterns to provide some target periods to help you evaluate your decision options.

It's important to note that global production can also have an influence on pricing patterns. The difference in growing seasons can mean ample supplies of commodities are available during off-seasons for some countries. For more information, review the MSU factsheet "When Is The Best Time to Sell Grain" at https://www.canr.msu.edu/resources/when-is-the-best-time-to-sell-grain.

04 How do pricing tools or contracts work?

Each type of pricing decision tool or contract captures some aspect of a final cash price. For example, a basis contract locks in the local basis. This allows the potential to capture a better futures price if it increases before the intended delivery date. Similarly, a hedge-to-arrive locks in the futures price for an intended delivery period and allows a potentially better basis to be set later on. Pricing decision tools can help to mitigate the risks when prices move in opposite or unfavorable directions for your farm. More details on pricing decision tools can be found in MSU Bulletin E-3416: Introduction to Grain Marketing: https://www.canr.msu.edu/resources/bulletin-e-3416-introduction-to-grain-marketing

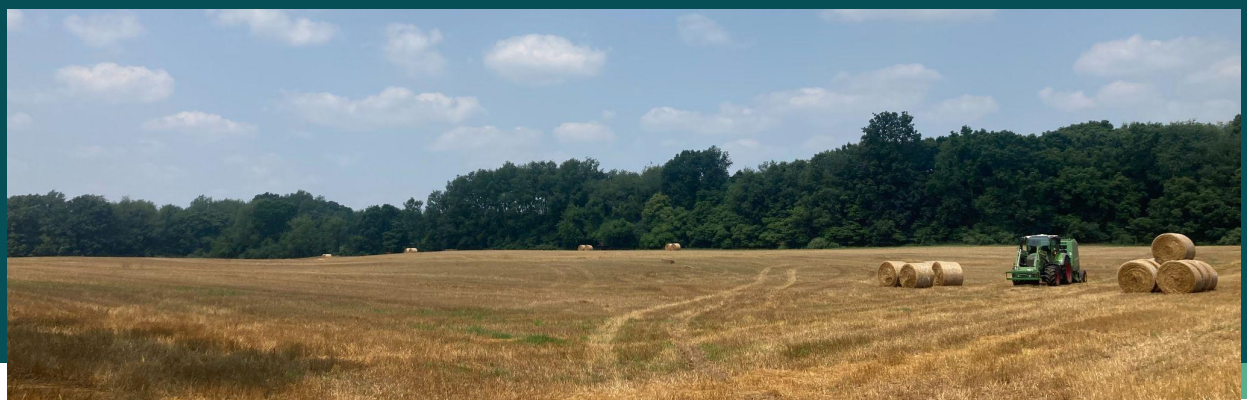
05 What's involved in creating a marketing plan?

A marketing plan is defined as a proactive strategy to price grain. It takes into consideration financial goals, cash flow needs, crop insurance coverage, anticipated production, storage capacity, and your appetite for risk. A marketing plan needs to start with a description of the plan goals. Goals can be short or more detailed, depending on what you're trying to achieve.

Bushel objectives and pricing targets are the next part of the marketing plan. Once you've identified how much of your production will be marketed, break the total number down to smaller amounts. Set a pricing target by using your cost of production to determine the average price you want to reach. Then you can create price targets around that average.

Setting decision deadlines is the next step in your marketing plan. If prices do not meet your price target, the deadlines ensure you are proactive about pricing. Deadlines work with pricing targets to help you make sales when you need to. They can also help to look ahead to upcoming payments if opportunities for better pricing exist and you want to test the market longer.

The last component of a marketing plan is pricing decision tools or contracts. Pricing decision tools help to decide how you're going to price grain once you reach a decision deadline.



RESOURCES & PARTNERS

Necessary Resources

- MSU Extension Commodity Marketing homepage: https://www.canr.msu.edu/tag/commodity-marketing
- MSU Bulletin E-3411: Introduction to Cost of Production and Its Uses: https://www.canr.msu.edu/resources/bulletin-e-3411-introduction-to-cost-of-production-and-its-uses
- MSU factsheet: When Is The Best Time to Sell Grain: https://www.canr.msu.edu/resources/when-is-the-best-time-to-sell-grain
- MSU Bulletin E-3416: Introduction to Grain Marketing: https://www.canr.msu.edu/resources/bulletin-e-3416-introduction-to-grain-marketing
- Michigan State University Grain Marketing Basics Workshop: https://www.canr.msu.edu/resources/grain-marketing-basics-workshop
- Commodity Challenge: https://commoditychallenge.com
- Iowa State University Grain Marketing: https://www.extension.iastate.edu/agdm/cdmarkets.html

Educational Programs & Events

- MSU Extension Grain Gains: An Introduction to Grain Marketing Self-Paced Online Course: https://www.canr.msu.edu/courses/grain-gains-an-introduction-to-grain-marketing
- MSU Extension Field Crops Virtual Breakfast Series: https://www.canr.msu.edu/field_crops/virtual-breakfast/ (September usually holds a Grain Marketing session)

Partners

- Cargill, Inc: https://www.cargillag.com/home
- Michigan Agricultural Commodities, Inc: https://www.michag.com/
- The Andersons, Inc: https://www.andersonsgrain.com/
- U.S. Grains Council: https://grains.org/



SECTION 5

Producing, Selling, & Marketing

VALUE-ADDED PRODUCTS

Primary Considerations

In Michigan, the term “value-added agricultural products” is formally defined under the Julian-Stille Value-Added Act (Public Act 322 of 2000), which pertains to the Michigan Department of Agriculture and Rural Development (MDARD) grant programs. According to that Act, “Value-added” means the enhancement or improvement of the overall value of an agricultural commodity or of an animal or plant product into a product of higher value. The enhancement or improvement includes, but is not limited to, marketing, agricultural processing, transforming, or packaging. Examples include milling wheat into flour, pressing apples into cider, or converting berries into jam.

Value-added products (even similar items) may have different licensing requirements and regulations depending on what ingredients are used, the location or facility in which it is being produced, the packaging materials used, the distribution or shipping methods, as well as a variety of other factors.

Licensing and regulation for food and beverage production in Michigan is administered by:

- Local Health Departments
- Michigan Department of Agriculture and Rural Development (MDARD)
- U.S. Department of Agriculture (USDA)
- U.S. Food and Drug Administration (FDA)
- Local zoning regulations
- Michigan Department of Environment, Great Lakes and Energy (EGLE)



The **Michigan Cottage Food Law (Public Act 113 of 2010)** allows individuals to produce certain "non-potentially hazardous" foods in the unlicensed, uninspected kitchen of their primary residence and sell them directly to consumers at venues like farmers markets, farm stands, and craft fairs, provided annual gross sales ***do not exceed $25,000 per household.***

Eligible foods include shelf-stable baked goods, fruit jams/jellies, candies, popcorn, granola, dry mixes, dried pasta, roasted coffee, and vinegars, while **prohibited items** include any requiring refrigeration or time/temperature control, such as meats, dairy products, pickled goods, salsas, cream pies, beverages, and pet foods. Sales to restaurants, retailers, or online are not allowed.

ELIGIBLE



PROHIBITED



All products must be labeled with the statement "*Made in a home kitchen that has not been inspected by the Michigan Department of Agriculture & Rural Development*" (in at least 11-point type), along with the **product name**, **producer's name** and **physical address**, **ingredient list in descending weight order**, **net weight or volume**, and **allergen declarations**. While no license or routine inspection is required, producers must still follow safe food handling practices, and Michigan State University Extension offers training and resources to help cottage food businesses operate legally and safely.

Process for Getting Started

Successful business ventures start out with detailed planning. Writing a business plan, startup budget and operating budget specifically for your value-added agricultural products is generally worth the time and energy to ensure the long-term success of the venture. See the *Business Planning* section of this guide for more information.

Once you have a business plan completed, you can seek counseling from the Michigan State University Product Center to guide you through the licensing process. To request counseling from the MSU Product Center, **click on the "Become a Client" link** at the top of the website. There is a one-time $100 application fee to request counseling from the MSU Product Center.





SECTION 5: VALUE-ADDED PRODUCTS

COMMON QUESTIONS

01 How do I develop a commercial-ready recipe?

Developing a **commercially ready recipe** for a value-added agricultural product begins with selecting a marketable concept that highlights the unique qualities of the raw ingredient, followed by test batches to refine flavor, texture, and appearance while ensuring consistent quality.

If you are developing a shelf stable product in a sealed container that is not produced under the Michigan Cottage Food Law, a licensed commercial kitchen will be required and a retail or wholesale processing license must be secured. Shelf stable products in sealed containers typically require **Process Authority Review.**

Once you have finalized the recipe, measurements are converted to precise weights for repeatability, and ingredient sourcing is evaluated for availability, cost, and compliance with food safety standards.

02 How do I secure the proper licensing?

Value-added products (even similar items) may have different licensing requirements and regulations depending on what ingredients are used, the location or facility in which it is being produced, the packaging materials used, the distribution or shipping methods, as well as a variety of other factors.

Licensing and regulation for food and beverage production in Michigan is administered by:

- Local Health Departments
- Michigan Department of Agriculture and Rural Development (MDARD)
- U.S. Department of Agriculture (USDA)
- U.S. Food and Drug Administration (FDA)
- Local zoning regulations
- Michigan Department of Environment, Great Lakes and Energy (EGLE)

To learn more about licensing required to sell a packaged food or beverage product, contact the Michigan Department of Agriculture and Rural Development at 1-800-292-3939 to speak with an inspector about your licensing requirements. If you are selling ready-to-eat foods or beverages, contact your local health department for licensing information.

03 What are the labeling requirements?



Packaged food and beverage products must be labeled in compliance with both the Michigan Food Law and applicable federal regulations, meaning each label must clearly display the product's common or usual name, the name and physical address of the manufacturer, packer, or distributor, the net quantity of contents by weight, volume, or count, and a **complete ingredient list in descending order by weight, including sub-ingredients when applicable.**

Labels must also identify any of the nine major allergens (milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, sesame and soybeans) as required by the Food Allergen Labeling and Consumer Protection Act (FALCPA), and **nutrition facts must be provided unless the product qualifies for an exemption** (such as certain small businesses).

Michigan Cottage food products require the additional statement, in at least 11-point type, "Made in a home kitchen that has not been inspected by the Michigan Department of Agriculture & Rural Development." All required information must be prominent, legible, and in English to ensure consumers can make informed and safe purchasing decisions.

04 How do I price my product(s)?

Pricing value-added agricultural products works best when you combine cost-based pricing with market-based pricing so you cover expenses, pay yourself fairly, and remain competitive. Here's a step-by-step approach you can use:

STEP 1:

Calculate your total costs – Include all direct costs (ingredients, packaging, labels), indirect costs (utilities, equipment, labor—even your own time at a fair hourly rate), and fixed costs (licenses, insurance, marketing, and distribution). Don't forget things like fuel or booth fees. Grocery retailers typically add a 30% markup for shelf stable products and a 50% mark-up for refrigerated or frozen products.

STEP 2:

Add your desired profit margin – A common target for food products is 30–50% over total costs, but this can vary depending on your market, brand positioning, and product uniqueness.

STEP 3:

Research your market – Visit farmers markets, specialty stores, and online shops to see what similar products sell for. Note differences in size, quality, packaging, and branding to help position your product.

STEP 4:

Adjust for perceived value – If your product has a unique selling point (organic ingredients, locally sourced, small batch, heritage varieties), you can often price at a premium because customers are paying for the story, quality, and experience.

STEP 5:

Check your price against customer willingness to pay – Test at markets or events. If your product sells too quickly, you might be underpricing; if sales are slow, you may need to adjust pricing or packaging size.

STEP 6:

Review regularly – Ingredient and packaging costs change over time, so revisit your pricing at least annually to keep your profit margin healthy.The MSU Product Center offers a Pricing Worksheet to clients. See information below on becoming a client of the MSU Product Center.

05 How do I sell my product(s)?

Your business plan should outline your target customer base and your strategies for reaching these customers. If you are planning on selling your products on your farm, make sure you are following your township's (or city's) zoning regulations. You can also familiarize yourself with the **Michigan Generally Accepted Agricultural Management Practices related to Farm Markets.**

You may also want to sell value-added products in community-run farmers markets. You can find a list of farmers markets throughout the state on the **Michigan Farmers Market Association's website**. Research the costs involved and requirements to become a farmers market vendor in your targeted geographic region(s). Farmers markets typically require all vendors to carry liability insurance for your products.

If you are selling under the Michigan Cottage Food Law, you are not allowed to sell products 100% online. You are also not allowed to sell your products to wholesale customers like grocery stores, restaurants or coffee shops.

If you have secured licensing and are operating in a licensed commercial kitchen, you are permitted to sell products online, to wholesale customers, and directly to consumers.



RESOURCES & PARTNERS

Necessary Resources

- Michigan State University Product Center: https://www.canr.msu.edu/productcenter/
- Michigan Department of Agriculture and Rural Development Cottage Food Law Resources and FAQ: https://www.michigan.gov/mdard/food-dairy/michigan-cottage-foods-information
- Michigan Department of Agriculture and Rural Development Food Licensing: https://www.michigan.gov/mdard/licensing/food/foodest/michigan-food-establishment-license-applications
- Selling Food In Michigan Guide: https://www.canr.msu.edu/productcenter/selling-food-in-michigan
- Michigan Generally Accepted Agricultural Management Practices related to Farm Markets
- Nutrition Facts Labeling Resource: https://www.canr.msu.edu/resources/nutrition-facts-labeling

- Ingredient List Resource: https://www.canr.msu.edu/news/writing-an-accurate-ingredient-statement-for-packaged-food-products
- Process Authority Review Resource: https://www.canr.msu.edu/resources/process-authority-review
- Commercially Ready Recipe Resource: https://www.canr.msu.edu/news/converting-a-kitchen-recipe-to-a-commercial-formula

Educational Programs

- Regulatory and Food Safety Overview Online Course: https://www.canr.msu.edu/courses/regulatory-and-food-safety-overview
- MSU Extension ServSafe Courses: https://www.canr.msu.edu/servsafe/
- Starting a Commercial Food Business Online Course: https://www.canr.msu.edu/courses/starting-a-commercial-food-business
- MSU Extension Online Cottage Food Law Online Course: https://www.canr.msu.edu/cottage_food_law/online-michigan-cottage-food-law
- Sanitation Training for Small Food Establishments Online Course: https://www.canr.msu.edu/courses/sanitation-training-for-small-food-establishments

Partners

- Michigan Farmers Market Association: https://mifma.org/
- Taste the Local Difference: https://www.localdifference.org/
- Michigan Department of Agriculture and Rural Development: https://www.michigan.gov/mdard



SECTION 6

MARKETING EXPERIENCES

Primary Considerations

- Desired level of customer interaction
- Liability insurance
- Zoning ordinances
- Signage
- Parking and restroom facilities

Process for Getting Started

Inviting the public to your farm can come with a range of emotions from excitement to worry. Channel your excitement into ***planning the possibilities*** and your worry into ***preparations for safety and risk management.***





- Decide what experiences you would like to offer.
- Look into whether there are additional regulatory requirements that you'll need to meet in order to offer those experiences.
- Check your local zoning ordinances to see if there are any rules you will need to follow. Common aspects regulated by zoning ordinances include acceptable uses of a property, setbacks, signage and parking.
- Think through the logistics of offering the experience and make a plan.
- Determine what price to charge for the experience.
- Advertise to current and potential customers.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 6: MARKETING EXPERIENCES

COMMON QUESTIONS

01 What types of experiences can I offer?

The possibilities are nearly endless, limited only by your imagination and laws. Popular experiences include: shopping at the farm, pick-your-own/U-pick, farm tours, festivals, workshops, educational programs for children and adults, farmstays, live music, and food service. A good rule of thumb is to start small and grow your offerings with time.



02 What are the rules for hosting experiences on my farm?

As with many agricultural activities covered in this guide, it depends. The **Michigan Farm Market GAMMPS** , or Generally Accepted Agricultural and Management Practices for Farm Markets outlines statewide standards for farm markets to ensure they are complying with the Michigan Right to Farm Act. This will help protect your farm market or agritourism venture from certain aspects of local zoning regulations. Other local, state and federal regulations may apply depending on the types of activities you are offering.

As an alternative to hosting experiences on your farm, you can partner with local businesses and organizations to host events at their facilities: for example, a flower arranging workshop at a local coffee shop.

03 What are the liability considerations for my business?

Reach out to your insurance agent and be clear and detailed about the activities you would like to offer. They can advise the best coverage options.

04 How will people find out about the experiences I have to offer?

Start with your existing customers:

- Distribute flyers at your farmers market booth or in your CSA boxes.
- Post on social media.

Advertising in a farm directory can also be a great way to reach potential customers:

- **MarketMaker** is free for anyone to join and create a business profile.
- Members of the **Michigan Agritourism Association** receive a business listing in the print and online version of the Discover Michigan Farm Fun directory that the association publishes and distributes each year.
- **Taste the Local Difference** is a Michigan local food marketing company that also offers a directory in both online and print formats.

05 What's the best way to communicate farm policies and safety information with visitors?





Posting signs is a popular way to get key information across, especially in areas where visitors will have little to no contact with farm staff (such as restroom signs communicating handwashing expectations). Including this information on your farm website, event flyers, and social media can also be a great way to introduce policies and expectations to visitors prior to their arrival. Farm staff can also verbally communicate this information to farm guests. Generally, the more touch points guests have with policies, the more likely they are to follow them. The **Integrating Safety into Agritourism website** has information and resources for communicating with farm guests, including **printable signs.**



RESOURCES & PARTNERS

Necessary Resources

- Getting Started in Agritourism, Cornell Cooperative Extension: https://essex.cce.cornell.edu/resources/getting-started-in-agritourism
- University of Vermont Extension Agritourism Resources and Guides: https://www.uvm.edu/extension/agritourism-resources-and-guides
- The National Agricultural Law Center - Agritourism Overview: https://nationalaglawcenter.org/overview/agritourism/
- NCAT Marketing Tipsheet - Tips for Selling With Agritourism and "Pick-Your-Own": https://attra.ncat.org/publication/tips-for-selling-with-agritourism-and-pick-your-own/
- NCAT Marketing Tipsheet - Tips for Selling at Roadside Stands: https://attra.ncat.org/publication/tips-for-selling-at-roadside-stands/
- How to Use Farm Events to Attract New Customers and Profit - Profitable Mindset Podcast: https://charlottemsmith.com/7-farm-events-for-profit/

- Social Media Tips for Events on the Farm- Stokes Homestead Farm Market and Michigan Farm Fun: https://www.youtube.com/watch?v=S48C3V6hWQU&t=85s
- Tips for Hosting Classes on Your Farm, State of Vermont Agency of Agriculture Food and Markets: https://agriculture.vermont.gov/tips-hosting-classes-your-farm
- Michigan Farm Market GAMMPS: https://www.michigan.gov/mdard/environment/rtf/gaamps
- Cultivating Local Farm Economies: Emerging Issues in Planning, Zoning, and Agritourism Webinar Series: https://mediaspace.msu.edu/channel/Cultivating%2BLocal%2BFarm%2BEconomies%2BWebinar%2BSeries/215252103
- Integrating Safety Into Agritourism: https://safeagritourism.org/communication/
- MarketMaker: https://mi.foodmarketmaker.com/
- Taste the Local Difference: https://www.localdifference.org/find-food-farms/

Educational Programs & Events

- Great Lakes EXPO: Farm Market Bus Tour and Education Sessions: https://glexpo.com/
- Michigan Agritourism Association events and tours: https://www.michiganfarmfun.com/join.asp
- NAFDMA Convention, Farm Tours and Learning Retreats: https://www.nafdma.com/events
- MSU Extension Agritourism Summit: https://www.canr.msu.edu/agritourism_summit/

Partners

- Michigan Agritourism Association: https://www.michiganfarmfun.com/
- NAFDMA International Agritourism Association: https://www.nafdma.com/
- Taste the Local Difference: https://www.localdifference.org/

General

Risk Management



AUTHORS & INSTITUTIONS

Laurel Harduar Morano, Division of Occupational and Environmental Medicine, Michigan State University

Jonathan LaPorte, Farm Business Management Educator, Michigan State University Extension

SECTIONS

Section 1: Production Risk
Section 2: Price or Market Risk
Section 3: Financial Risk
Section 4: Institutional Risk
Section 5: Human Risk

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Owning and operating a farm often involves making decisions with incomplete or imperfect information. Not having all of the information leads to uncertainty, which creates risk or the possibility of negative or adverse outcomes. Risk management is a process of taking steps to mitigate or minimize impacts from risk on your farm business.

How To Get Started

Managing risk begins with recognizing the type of risk that you want to reduce or possibly prevent. Identification is critical to understanding the potential impacts of that risk, tactics or practices you can implement, if they are likely to work, and how to optimize your overall management approach. For example, farm managers that use integrated pest management strategies are encouraged to identify potential pests and their biology. Understanding a pest life cycle can direct monitoring activities, identify critical control periods and, if necessary, determine what pesticides should be utilized.



Risk identification is also important to understand if there are any management limitations. Some risks are simply outside of your ability to control and may require additional assistance to offset their potential impacts.

Farming involves many types of risks. Some risks are more difficult to manage than others. The most common are production, market or price, financial, institutional, and human or personal risk.

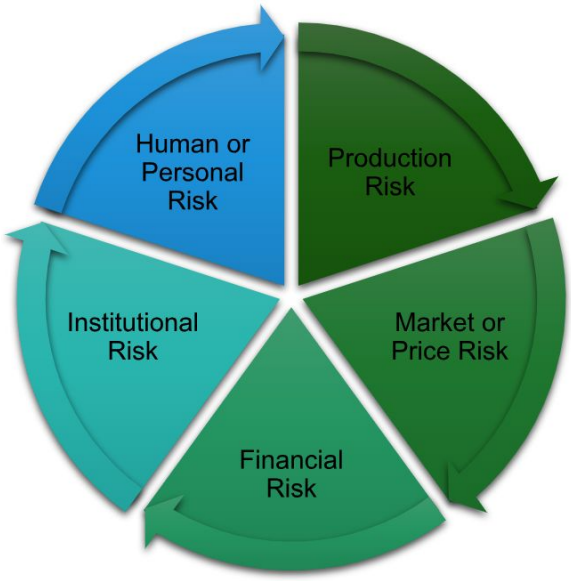


Figure 1. *Common types of farm risk*



SECTION 1

PRODUCTION RISK

Production risk derives from the uncertain natural growth processes of crops and livestock. Weather, disease, pests, and other factors affect both the quantity and quality of commodities produced (USDA ERS, 2023).



Primary Considerations

- Weather
- Disease
- Pests
- Health and Genetics(?) – Plants and Livestock
- Land Access

Process for Getting Started



Managing production risk starts with considering your production practices. There are many types of practices that can help to reduce the chances of an adverse impact on your production goals. Understanding how your production practices contribute to minimizing risk makes how you produce ultimately as important as what you produce.

Another option to manage production risk is through diversification of what you raise. By having more than one production area, or enterprise, you can reduce the chances of total production loss in a year. How to diversify your farm should include considerations of capital needs, access and availability of markets, and expertise required for each. Enterprises that require specialized equipment, knowledge and skillsets, or competition of time may reduce potential gains.

Sometimes reducing risk requires assistance from outside the farm. Insurance policies were created as a cost-effective means to aid farmers in managing or reducing the impact of production risks. Knowing which type of insurance policies to use, and their effectiveness, requires understanding what features are available and how they align with the needs of your farm.



Land access is another type of production risk. All production types, crops and livestock, can be traced back to a need for land. Navigating the pursuit of land starts with understanding the acquisition process. If your goal is to rent farmland, begin with gaining a better understanding of land characteristics, how those influence production goals, and how to discuss those details with a landowner in the negotiation process. If your goal is to purchase land, starting with a better understanding of land characteristics is also important.

Disclaimer. For a specific list of resources in the above description, view the Necessary Resources area of this section.





SECTION 1: PRODUCTION RISK

COMMON QUESTIONS

01 How do I discover what enterprises I can diversify my farm with?

Considering other enterprises to pursue involves understanding capital needs, available markets, and potential costs of production. Ideally, enterprises that make use of existing capital (i.e., buildings, equipment) on your farm can limit additional investment costs. Available markets in your area are an important consideration. You can't sell products if there isn't anyone willing to buy them. Gaining an idea of what potential costs may be will help to decide if that potential market and type of enterprise is profitable. The steps outlined in creating a business plan can provide guidance on identifying potential enterprises for your farm.

02 Is there an insurance option for my type of farm?

There are a number of different insurance options based on types of production for plants and livestock. There are also policies that focus on revenue or a combination of revenue and production. USDA Risk Management Agency (RMA) provides a listing of the different policies available on their National Fact Sheet page: https://www.rma.usda.gov/about-crop-insurance/fact-sheets

03 How does insurance work?

Insurance policies that focus on production use your historical production records as a baseline for possible losses. Revenue policies use historical revenue and/or recent market prices to establish possible losses. If you're starting out and don't have history for a baseline, there are county level baselines available for new managers. You select a level of coverage based on a percentage of those baselines. If your actual production and/or revenue for the year falls below the coverage level, you will get a payment for the difference between actual and coverage levels. For more information on how insurance policies work, visit **MSU Farm Business Revenue Insurance Resource Page**, which includes bulletins, factsheets, and videos on insurance policies and how they work (https://www.canr.msu.edu/tag/farm-business-revenue-insurance).

04 How much does insurance cost?

Each insurance policy has different levels of coverage and protection options that affect the premium you will pay. Finding the right coverage level and protection options is an important consideration of whether to pay for insurance. Insurance agents can help you to tailor policies to best fit your farm and provide an estimate of what premiums you'll pay. To find an insurance agent near you, visit: https://www.rma.usda.gov/tools-reports/agent-locator.

05 How do I know what a reasonable amount of rent is to pay for land?

Renting land requires understanding what it is you're paying for and whether you can afford to pay for it. Finding a reasonable amount of rent depends on the productivity of the farmland, your cost of production, market trends, and what you can negotiate with a landowner. A starting point for these considerations can be found in **MSU Extension's Bulletin E-3427 Introduction to Renting Farmland** (https://www.canr.msu.edu/resources/bulletin-e-3427-introduction-to-renting-farmland).



SECTION 1: PRODUCTION RISK

RESOURCES & PARTNERS

Necessary Resources

Production Practices

- See Chapters on Animal Agriculture and Plants

Diversification

- See Chapter on Marketing
- **MSU Farm Business Loans Resource Page**: Resources on this page include bulletins, factsheets, videos, and templates to help in obtaining finances to meet your capital needs (https://www.canr.msu.edu/tag/farm-business-loans).
- **MSU Farm Business Cost of Production Resource Page**: Resources on this page include bulletins, factsheets, videos, and templates to help put together a cost of production budget for various enterprises on your farm (https://www.canr.msu.edu/tag/farm-cost-of-production).

Insurance Policies

- USDA RMA offers a wide assortment of insurance policies for different types of production agriculture: https://www.rma.usda.gov/about-crop-insurance/fact-sheets
- USDA RMA offers a tool to help find a local insurance agent in your area who can help you navigate insurance policy options: https://www.rma.usda.gov/tools-reports/agent-locator.
- **MSU Farm Business Revenue Insurance Resource Page**: Resources on this page include bulletins, factsheets, and videos to help navigate insurance options for your farm (https://www.canr.msu.edu/tag/farm-business-revenue-insurance).

Land Access

- **MSU Farmland Leases Resource Page** (https://www.canr.msu.edu/tag/farmland-leasing): Resources on this page include factsheets, videos, and information on land rent values to help navigate the leasing of farmland.

Partners

- USDA Risk Management Agency (RMA) - https://www.rma.usda.gov/
- USDA Farm Service Agency (FSA) Farm Programs & Services - https://www.fsa.usda.gov/index
- Michigan Department of Agriculture & Rural Development (MDARD) - https://www.michigan.gov/mdard
- MIFarmLink - https://www.mifarmlink.org/
- Michigan Farm Bureau Insurance - https://www.michfb.com/insurance
- GreenStone Farm Credit Services - https://www.greenstonefcs.com/
- Eagle Valley Ag Risk Advisors, LLC - https://www.eaglevalley.ag/



SECTION 2

PRICE OR MARKET RISK

Price or market risk refers to uncertainty about the prices producers will receive for commodities or the prices they must pay for inputs. The nature of price risk varies significantly from commodity to commodity (USDA ERS, 2023).

Primary Considerations

- Identifying Cost of Production
- Accurate Farm Records
- Research of Potential Markets
- Marketing Tools (if applicable)

Process for Getting Started



As a decision-maker on the farm, you will define what a good selling price is for your business. However, defining a price that is good and profitable is not an easy task. Understanding the complexities involved can make marketing a challenge for even a seasoned farm manager. This is important because there are times when the market will not offer a profitable price.

The key to establishing a price and protecting against profit loss is to have a clear understanding of the farm's cost of production. Knowing what costs went into producing a marketable product establishes a minimum price that must be met. Identifying your cost of production requires good, accurate details in your farm records. It also requires an understanding of what costs should be included in establishing a minimum price.

Next, examine the various market channels to see which may be the best fit for your business goals. Then, do your own market research to determine how your products will sell in the markets you want to target. Base your search on several factors including the customer base, price sensitivity, presence of competitors, and more. Once you've identified potential markets, you need to establish what a good price is in those markets and determine if it is profitable.

Necessary Resources

- See **Marketing** under the ***General Topics section*** of this resource guide



SECTION 3

FINANCIAL RISK

Financial risk results when the farm business borrows money and creates an obligation to repay debt. Rising interest rates, the prospect of loans being called by lenders, and restricted credit availability are also aspects of financial risk (USDA ERS, 2023).

Process for Getting Started

Managing a farm involves investing time and money toward creating a successful business. Of these investments, having enough money to cover farm needs or offset losses is a concern for beginning farmers. A common resource for new managers to obtain money, or cash, is by seeking a loan from a farm lender.



A loan is not simply a source of funds, but an investment in your farm business and its plans for success. By providing funds, lenders help to reduce risk concerns that a lack of cash can create. However, by ensuring your ability to operate, a lender takes on an amount of your farm's risk from potential losses. When lenders agree to such investments, the expectation is that you will continue to work towards offsetting risks to your farm business.



Maintaining a risk management plan is as important as updating production or marketing plans. Many factors or events happen throughout the year that the farm has little or no control over. These events are often unexpected, such as poor weather or low market prices. Your plan for mitigating these types of risks should include identifying changes you've made or are being made to offset them. Changes may be in marketing strategies, capital assets used to secure a loan, production practices, types of production grown, and even insurance policies.

The next step is to consider how changes to offset risk will impact financial risks. These can include market environments, production environments, loan security, cash availability, cash flow and repayment of lender debt.

Necessary Resources

- See the **Financing** section of this resource guide.



SECTION 4

INSTITUTIONAL RISK

Institutional risk results from uncertainties surrounding Government actions. Tax laws, regulations for chemical use, rules for animal waste disposal, and the level of price or income support payments are examples of government decisions that can have a major impact on the farm business (USDA ERS, 2023).

Necessary Resources

- See the **Tax Management** section of this resource guide.



SECTION 5

HUMAN RISK

Human or personal risk refers to factors such as problems with human health or personal relationships that can affect the farm business. Injuries, illness, death, and divorce are examples of personal crises that can threaten a farm business (USDA ERS, 2023).

Process for Getting Started

Farming is one of the most dangerous occupations in the United States. It involves long hours, fatigue, and even stress that can add to the risk of injury. When we experience these effects, it can lead to distraction or cause errors that may lead to incidents that may be serious and even fatal.

Property safety precautions are essential to avoiding those types of incidents. Safety on the farm begins by identifying potential hazards around the farm and creating a plan to protect yourself, your workers, and family members. This may include, knowing when to and not to enter an area, wearing the proper work attire and personal protective equipment, ensuring you or other farm workers are visible to each other, and having an emergency plan in case the worst happens.



For equipment, safety starts with routine maintenance and keeping machinery in good working order. Reading the operation manual to identify all hazards and use all safety features is also a necessity. For used equipment, this may require ordering a replacement manual from the manufacturer or another online company.

Working with livestock requires understanding an animal's behavior or responses to changes in its environment. Training on equipment, procedures, and policies is also essential – all workers and family members working on the farm should understand how to keep themselves and others safe.



SECTION 5: HUMAN RISK

COMMON QUESTIONS

01 If a severe injury or death occurs on my farm, am I required to report it to Michigan Occupational Safety and Health Administration (MIOSHA)?

Yes, if the person injured was working on the farm at the time of the incident (paid worker, unpaid family member, volunteer, owner). All farms in Michigan are required to report; small farming operations are not exempt. Failure to report can result in citations and monetary penalties.

Death: If a death occurs, then MIOSHA requires reporting within ***8 hours of the death***. The MIOSHA toll-free number to report work-related fatalities/catastrophes is 800-858-0397.

Severe Injuries: For injuries that do not result in death, reporting is still required if the individual lost an eye, suffered an amputation, or was hospitalized. MIOSHA requires reporting of a severe injury within ***24 hours of the incident*** causing the severe injury. There are two ways to report: online (https://forms.leo.state.mi.us/miosha-incident-report/) or via the toll-free number, 844-464-6742.



SECTION 5: HUMAN RISK

RESOURCES & PARTNERS

Necessary Resources

- MIOSHA severe injury/death reporting requirements: https://www.michigan.gov/leo/bureaus-agencies/miosha/reporting-fatalities-and-injuries
- Michigan Farm safety resources: https://oem.msu.edu/index.php/work-related-injuries/farm-related-injuries
- Developing a farm safety plan: https://icash.public-health.uiowa.edu/programs/seasonal-campaigns/farm-safety-planning
- Safety guidelines for youth working, visiting, and living on the farm: https://cultivatesafety.org/
- Farm Safety for youth (age 14- to 17-years old) training program: https://www.fb.org/initiative/farm-bureau-safety-health-network/think-f-a-s-t

Partners

- National Ag Safety Database (NASD) topics page: https://nasdonline.org/browse.php
- Michigan Occupational Safety and Health Administration: https://www.michigan.gov/leo/bureaus-agencies/miosha/topics/agricultural-operations
- National Occupational Safety and Health Administration: https://www.osha.gov/agricultural-operations
- National Institute for Occupational Safety and Health: https://www.cdc.gov/niosh/agriculture/about/index.html

General Topics

Setting Up a Farm Business



AUTHORS & INSTITUTIONS

Mariel Borgman, Community Food Systems Educator,
Michigan State University Extension

Corey Clark, Farm Business Management Educator,
Michigan State University Extension

SECTIONS

Section 1: Deciding on a Business Structure
Section 2: Filing Legal Paperwork to Establish Your Business
Section 3: Additional Steps in Establishing Your Farm Business

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES

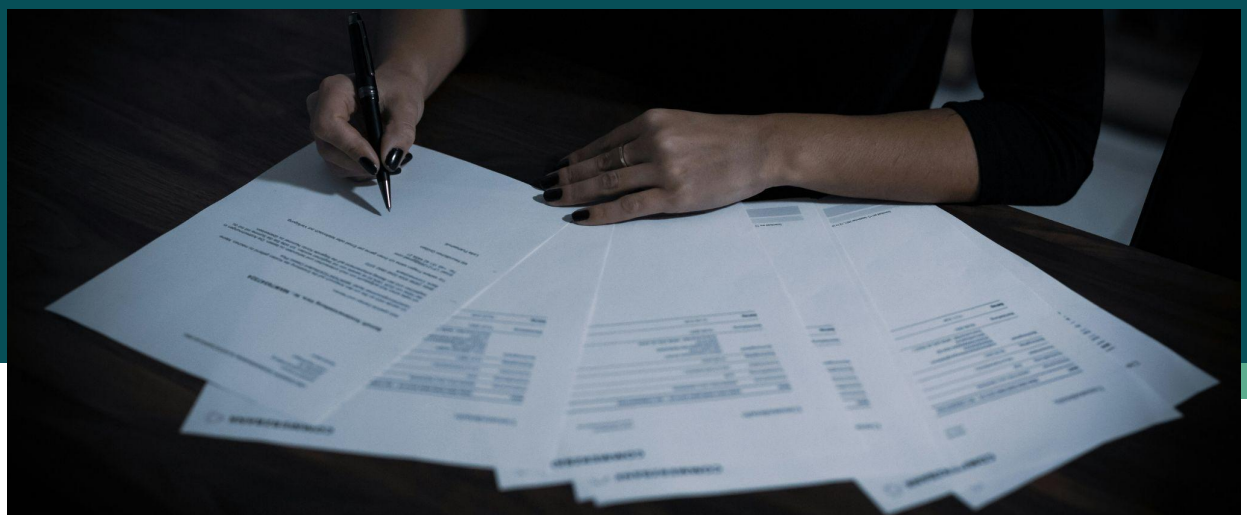


INTRODUCTION

Beginning farmers may wish to formally set up their farm as a business for a number of reasons, including tax benefits, risk and liability management and others. Setting up a farm as a business involves deciding on a business structure, registering the business with the appropriate governmental agencies, establishing separate financial accounts for the business and considering insurance needs for the business.

It is also good for beginning farmers to know that the United States Government defines a farm and farm business by the following financial measures:

- **USDA Economic Research Service** defines a farm as any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the year.
- Farms are eligible to file taxes as a farm if they meet the IRS definition of a farm business from the **Farmers Tax Guide**: a farm is a business if it cultivates, operates and manages for profit. The IRS uses nine criteria to evaluate whether a farm can be considered a business.



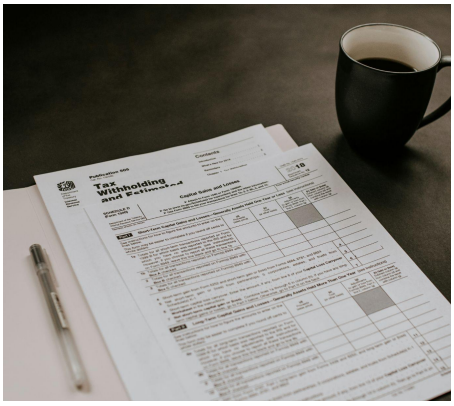
SECTION 1

Deciding on a Business Structure

Primary Considerations

- Goals of farm owners and decision makers
- Farm vision, mission and values

Process for Getting Started



- If you plan to operate the business as an individual with no separate entity for the business, you are operating as a sole proprietorship. Effectively operating a business as a sole proprietorship requires you to keep the finances of the business separate from your personal finances.

- If you are not a sole proprietorship, bring together anyone who will be a co-owner of the business to decide on a business structure.
- Consult an attorney/and or tax professional to discuss your ideas and get their opinion on which business structure may be right for your farm business.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 1

COMMON QUESTIONS

01 Do I need to establish my farm as a business?

No, but any income generated from your farming activities still needs to be reported to the IRS, even if you are just selling to family, friends and neighbors. There are some tax benefits of establishing a farm as a business. In particular, your farm expenses cannot be deducted from your tax return if your farm is not a business. Farm businesses in Michigan are also exempt from paying sales tax. Refer to the Tax Management chapter of this guide for more information on farm taxes.

02 What options do I have for structuring my farm business?

Sole Proprietorship

A structure for a business that has a single owner. In a sole proprietorship, there is no legal separation between the business and the owner, so the owner personally assumes all liability risk and owns all liabilities and debts of the business. Business taxes will be filed on the owner's personal tax return.

Partnership

This structure works for businesses that have two or more owners. In a general partnership, the business may own farm assets and files its own Schedule F. However, the partners assume all risk for liability and debts of the business. A partnership can also be set up as a limited partnership that can have "limited partners" whose individual liability is limited to their investment in the partnership.

Limited Liability Company (LLC)

A limited liability company, or LLC, can have one or more owners. The LLC is a separate business entity that owns assets and conducts operations. As a result, owners do not have the risk for liability and creditors. However, there is more complexity in establishing and maintaining the business. LLCs offer a lot of flexibility in structure and taxation, but they require more formality than a sole proprietorship or partnership (although less than a corporation).

C-Corporations

Structuring a business as a corporation establishes the business as a separate legal entity from its owners, removing any personal liability. A corporation must establish a governance structure, including a board of directors hired by shareholders and officers hired by the board of directors, who run the company day-to-day. A significant amount of formality is required to maintain this business structure.

S-Corporations

Small corporations and LLCs can request the IRS to consider them subchapter S corporations, which allows them some potential tax advantages over other business structures. In order to qualify for subchapter S, corporations must meet a series of requirements, including having 100 or fewer shareholders. Care must be taken to meet all the formal requirements of this business type to maintain S- status.

Low-Profit Limited Liability Company (L3C)

This is a newer business structure available in a handful of states, including Michigan. The Low-Profit Limited Liability Company is a structure that combines some of the aspects of a for-profit business with aspects that traditionally only applied to non-profits.

Cooperative

In the agricultural industry, many cooperatives are formed for the purpose of marketing and selling products. However, this business structure can also work for groups of farmers who are farming collaboratively on a single farm site. A cooperative is a business that is owned and operated by members.

501(c)(3) Nonprofit

For farms that have a mission centered on education, food access or other charitable goals, a 501(c)(3) nonprofit structure may be the right fit. It's important to note that farms can have a social mission and impact even if they are set up as one the other types of business structures.

Entity Comparison Chart

		LLC	C Corp	B Corp	S Corp	Cooperative	Non-Profit	Sole Proprietor	General Partnership
Formalities and Structure	Organizing document is required		✓	✓	✓	✓	✓		
	Annual meetings are required		✓	✓	✓	✓	✓		
	One owner is okay	✓	✓	✓	✓			✓	
Benefits	Can sell or transfer entity to others	✓	✓	✓	✓	✓			
	Personal liability is protected	✓	✓	✓	✓	✓	✓		
	Owners can make a profit	✓	✓	✓	✓	✓		✓	✓
	Can prioritize a social purpose over making profits	✓		✓	✓	✓	✓	✓	✓
Tax Implications	Entity does not have to pay taxes (pass-through)	✓			✓			✓	✓
	Potential self-employment tax savings				✓				
	Potential to be tax exempt						✓		
	Potential for donors to receive a tax deduction						✓		
	Potential for favorable tax deductions on business entity's earnings					✓			

03 Does my business need an operating (or governance) document?

All businesses should have a governance document that outlines ownership, operation and management, although the requirements and form vary with business entity type.

A. **Partnership:** A partnership agreement is a contract between partners that sets out each partner's rights, responsibilities, and share of profits and losses. It should cover decision-making authority, capital contributions, dispute resolution and exit strategies. Though not always legally required, it is essential for preventing conflicts and clarifying expectations.

B. **Corporation:** Bylaws are the governing rules for a corporation, outlining how the organization will operate. They typically include procedures for electing directors and officers, holding meetings, voting, and managing corporate records. Bylaws are required under Michigan law for corporations and must be adopted at the first meeting.

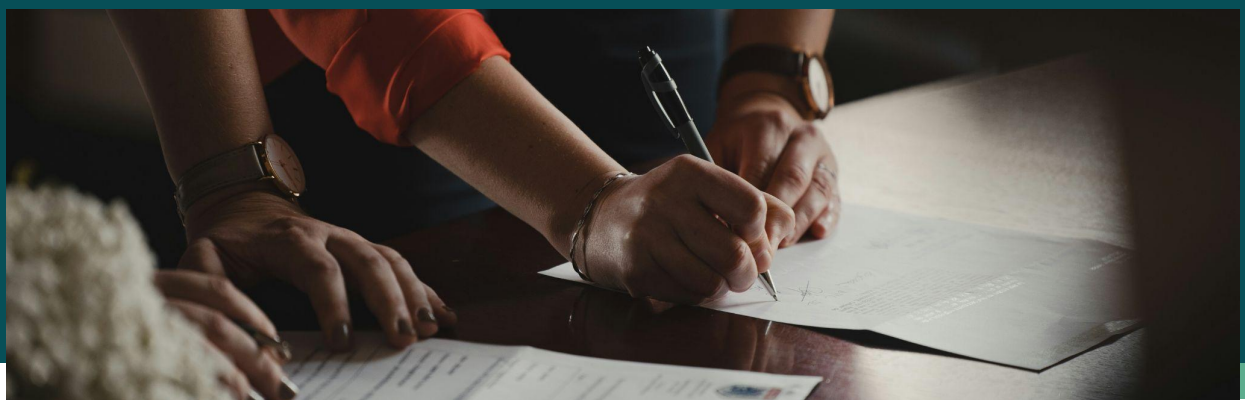
C. **LLC:** An operating agreement is an internal document for LLCs that defines how the business will be managed and operated. It typically includes ownership percentages, voting rights, profit distribution, management roles, and procedures for adding or removing members. While it is not legally required in Michigan, it is strongly recommended for multi-member LLCs and often needed for banking and financing.

04 How do liability and risk differ between business structures?

Liability protection varies significantly by structure. Sole proprietorships and general partnerships do not separate personal and business assets sufficiently to protect owners from being personally responsible for debts and legal claims. LLCs and corporations create a legal barrier between the business and its owners, which reduces personal risk to the ownership of the business entity. However, this protection depends on following required formalities.

05 Can I change my business structure later if my farm grows or my goals change?

Yes, most farms can change their business structure as they evolve. For example, a sole proprietorship can convert to an LLC or corporation to gain liability protection. Restructuring may involve filing new paperwork, paying fees and updating tax registrations, so it's best to plan ahead and consult a professional.



SECTION 1

RESOURCES & PARTNERS

Necessary Resources

- Farmers' Guide to Business Structures - SARE Publication
- Michigan Cooperative Development Program
- Basic Considerations for Choosing a Nonprofit Farm article from Farm Commons
- Michigan Small Business Development Center Guide to Starting and Operating a Small Business

Partners

- Michigan Small Business Development Center (MSBDC): https://michigansbdc.org/



SECTION 2

Filing Legal Paperwork to Establish Your Business

Primary Considerations

- Business Structure
- Business Plan

Process for Getting Started

It's recommended that you have a business plan written prior to filing legal documentation for your farm business. For business plan writing resources, refer to the chapter on Farm Business Planning.

- You'll need to have a name selected for your business when you file paperwork. For sole proprietorships and general partnerships, you can use your legal name (or your partner's legal name in the case of a partnership) or you can choose to use a different name for the business. For other business types, you'll need to choose a business name.

Start with your local government

- Check to see if your city, village, township, etc. has any requirements for registering businesses.
- If you wish to operate your business as a sole proprietorship or general partnership under a business name that is not your personal name or your partner's name, file a "doing business as" or DBA certificate with your county clerk.

File business paperwork with the state and federal government

- If your business is structured as a limited partnership, LLC, C corporation or S corporation you will need to file with the **Michigan Department of Licensing and Regulatory Affairs (LARA)**
  - A limited partnership will file a document called a "certificate of limited partnership."
  - An LLC, C corporation or S corporation will file a document called "articles of incorporation." There is a fee associated with the initial filing of the articles of incorporation as well as an annual fee each year to maintain the business' legal structure.

Register your business for state and federal taxes

- Apply for an Employer Identification Number (EIN) - This is required if you are in a corporation or partnership, an LLC with two or more members or a single member hiring employees. An EIN is optional for other LLCs and sole proprietors.
  - Complete the Online EIN Application
  - Fill out form SS-4 and mail to the IRS

Register your business for Michigan State Taxes

- Complete the Online New Business Registration process through the Michigan Treasury Office
  - If your sales are going to be taxable, you can obtain a sales tax license through this same online process.
  - OR download and print the State of Michigan Business Taxes Registration Booklet (Form 518) and mail it to the address listed on the form.
- If you are farming in the city limits of a Michigan city that collects an income tax, contact the city treasurer's office for more information.

Complete a sales tax exemption form.

- In Michigan, farms are exempt from paying sales tax on agricultural inputs. In order to receive the exception, complete the Michigan Sales and Use Tax Certification of Exemption (Form 3372) and present it to vendors when you are purchasing eligible items for agricultural production.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 2

COMMON QUESTIONS

01 Do I need to have an Employer Identification (EIN) Number if I'm not planning to hire employees?

It depends. Some business structures are required to apply for an EIN number regardless of whether the founder(s) of the farm will be doing all of the work. These include:

a. Partnerships

b. LLCs with two or more members

c. Corporations

02 How can I purchase supplies for my farm without being charged sales tax?

In the State of Michigan, there is no requirement for a sales tax exemption number for tangible personal property purchased for agricultural production. Tangible personal property could be items like seeds, fertilizer, spray materials, feed and similar items. When purchasing sales tax exempt agricultural items in Michigan, you must sign a certificate stating that the item is for agricultural production. For most agricultural retailers this certificate is part of the invoice or bill of sale. However other retailers may not be aware of this certificate and may ask for a sales tax exempt number. In this case, you'll need to show the certificate and inform the clerk that a sales tax exempt number is not required for farms. A copy of this certificate of exemption is available at the State of Michigan's website.

Items that are used in land improvement, real estate fixtures or motor vehicles used on highways are not sales tax exempt. Examples of non-sales tax exempt items include: fencing materials, barn cleaners, drain tile, lawn mowers, pumps, trucks and building materials.

03 How do I know if I will need to charge sales tax?

In Michigan, human food and food ingredients are generally exempt from sales and use tax with some exceptions:

- Prepared food
- Alcoholic beverages
- Tobacco

If you are selling your products as inputs to other farmers, the agricultural production exemption would apply, as defined by the Michigan Revenue Administrative Bulletin 2023-9. Items used or consumed directly or indirectly in tilling, planting, draining, caring for, maintaining, or harvesting things of the soil; breeding, raising or caring for livestock, poultry, or horticultural products, including transfers of livestock, poultry, or horticultural products for further growth.

For retail sale of all other items, you will need to charge 6% sales tax.

04 I haven't decided on a name for my farm business yet. What should I consider?

Sometimes a farm business name comes naturally, but other times it can be a very challenging task. Here are some things to think about when selecting a name for your farm business:

- What message do you want your farm name to convey?
  - Product-focused: clearly state what you sell, ex. Veggie Acres, Goats R Us
  - Location-based: use geographical features, ex. Main Street Urban Farm, Creekside Farm
  - Family or personal meaning: include your name or something very close to your heart, ex. Cindy's Flock, Jones Family Farm
  - Values-driven: highlight key attributes of your product or business, ex. Shared Abundance Acres, Soil First Farm
  - Creative and memorable: use wordplay, alliteration, or humor for an unforgettable name, ex. Grain-ing Momentum, Ewe-nique Pastures
- Is anyone else already using this business name? This is important for both legal registration of the business name and also ensuring that potential customers can easily find your business when searching online. Here are some ways to find out if another business is using the same name or something very similar:
  - Do a web search for the business name
  - Search the availability of domain names that use the business name using a domain availability search tool. Most websites that sell domain names such as Wix, GoDaddy, Squarespace, Network Solutions and others have a domain availability search tool.
  - Conduct a trademark search to see if any other business has already trademarked the name.

05 Why is it important to file paperwork correctly or on time?

Filing paperwork accurately and meeting deadlines ensures your business remains in good standing and retains its legal protections. Missing filings or making errors can lead to penalties, late fees, or loss of liability protection. Failure to maintain S-corporation formalities, in particular, can result in loss of S- status and its tax advantages. Failure to file correct and on-time paperwork can also delay tax registration and access to financing, so review requirements carefully and seek professional help when needed.

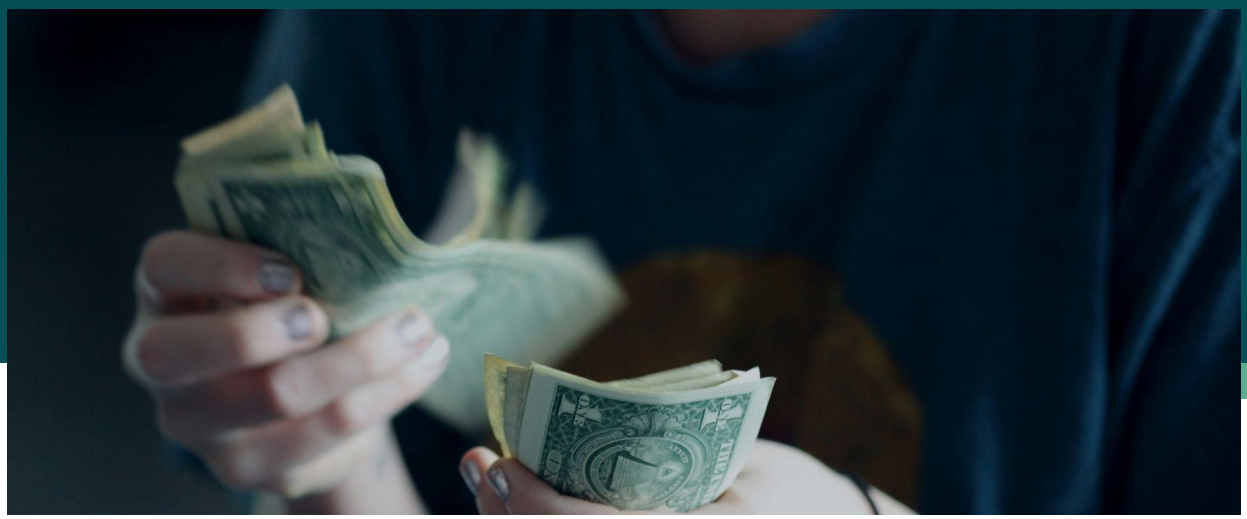


SECTION 2

RESOURCES & PARTNERS

Necessary Resources

- Sales and Use Tax - Food for Human Consumption - Michigan Department of Treasury
- Sales and Use Tax Agricultural Production Exemption- Michigan Revenue Administrative Bulletin 2023-9
- Michigan Sales and Use Tax Certificate of Exemption
- Which Cities Impose an Income Tax? - State of Michigan
- State of Michigan Business Taxes Registration Booklet (Form 518)
- Online New Business Registration - Michigan Treasury Office
- Employer Identification Number (EIN) Online EIN Application or fill out form SS-4 and mail to the IRS
- Michigan Department of Licensing and Regulatory Affairs (LARA)
- Trademark Search - United States Patent and Trademark Office



SECTION 3

Additional Steps in Establishing Your Farm Business

Primary Considerations

- Separate farm finances from personal finances
- Position your farm to be ready for financing through USDA or other lenders
- Secure eligibility for funding through USDA farm conservation programs

Process for Getting Started

- Set up a business checking account that is separate from your personal bank account. Ensure that all business transactions go through the business checking account and personal transactions through your personal account. You may draw funds out of the business account for personal use.
- Register for a farm number to participate in USDA programs
- Consider whether you need business insurance - contact an insurance agent to discuss the types of insurance your farm business may need

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 3

COMMON QUESTIONS

01 Why do I need a separate checking account for my farm business?

Establishing a dedicated checking account for your farm business is important for a number of reasons:

- Separating your business finances from your personal finances makes accounting, tax preparation and business planning and decision-making much easier and prevents confusion of which transactions are associated with the farm and which are personal.
- By having a dedicated business account, you can establish a financial history for the farm that is crucial for establishing credit for the business and applying to loans, grants and other financial assistance programs.

02 Why do I need a farm number and how do I get one?

Farm numbers are assigned by the USDA Farm Service Agency (FSA) and are required to access USDA programs such as loans, disaster assistance, crop insurance and payments for implementing conservation programs. Farms with a farm number will also receive the Agricultural Census, which is important for collecting agricultural data and allocating government resources to agriculture. The USDA has service centers located around the state where you can register for a farm number and learn about programs offered through FSA and the Natural Resources Conservation Service (NRCS). You can find your local service center at this website: https://www.farmers.gov/working-with-us/USDA-service-centers

03 What type of insurance do I need?

The answer to this question really depends on a number of factors, including what your farm produces, where you are selling it, whether you have employees, if the public is entering your farm and more. The best way to answer this question is to talk with a licensed insurance agent who is familiar with the type of farm business you are in.

04 What records should I keep to stay organized and prepare for financing or taxes?

Keeping accurate records is essential for managing your farm business and meeting legal and financial obligations. At a minimum, you will need detailed income and expense records, receipts for purchases, invoices for sales, and bank statements for your business account. These records help you track profitability, prepare tax returns, and demonstrate eligibility for loans or grants. In addition to financial records, keep copies of legal documents such as your business registration, operating or partnership agreements, as well as insurance policies and permits. Good recordkeeping makes compliance easier and builds credibility with lenders and partners.

05 What do I need to do to prepare for hiring employees?

Before bringing employees onboard, you need to set up the administrative framework for complying with labor laws and managing payroll correctly. This includes registering for tax accounts, securing insurance and creating systems for recordkeeping and wage reporting:

- An Employer Identification Number (EIN) is required for payroll and filing tax returns.
- Register with the IRS and the state payroll systems, including any online systems:
  - IRS for federal withholding, Social Security and Medicare contributions, and federal unemployment (if required)
  - Michigan Department of Treasury for state withholding
  - Michigan Unemployment Insurance Agency for state unemployment.[CC1]
- Set up a payroll system with software or a service provider to calculate wages, withhold taxes, and issue paychecks
- Secure workers' compensation insurance through a licensed insurance company
- Complete and maintain required employee records, like W-4 forms, I-9 forms, and timekeeping records



SECTION 3

RESOURCES & PARTNERS

Necessary Resources

- Getting Started at Your USDA Service Center
- Registering with USDA Farm Service Agency guide from MIFFS
- The MIFFS Farmers' Guide to EQIP
- IRS: Tax withholding and EFTPS payment system
- State of Michigan Business Taxes
- Michigan Unemployment Employer Help Center

Partners

- Michigan Food & Farming Systems - https://miffs.org/

General Topics

Tax Management



AUTHORS & INSTITUTIONS

Corey Clark, Michigan State University Extension

SECTIONS

Section 1: Defining a Farm Business
Section 2: Farm Recordkeeping for Income Taxes
Section 3: Farm Income Tax Returns
Section 4: Business Structure
Section 5: Income Tax Planning

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



INTRODUCTION

Taxes are a critical part of farm financial management. Understanding how they apply to your operation can help you make informed decisions and avoid costly mistakes. This document is designed to guide farmers through key tax considerations, from determining whether your operation qualifies as a farm business to managing records, filing returns, and planning for year-end.

The first step is to define your farm business. The IRS requires that an operation produces agricultural or horticultural products and be managed with a profit motive to qualify as a business. This distinction determines whether you can deduct expenses and file Schedule F. Next, accurate recordkeeping is essential for compliance and audit protection. Most farms use the cash method of accounting, and maintaining organized records of income, expenses, and assets simplifies tax preparation.

Understanding farm tax returns is equally important. Schedule F reports farm income and expenses, while other forms address depreciation, asset sales, and self-employment tax. Some aspects of your tax return will depend on the structure of your business. Finally, proactive tax planning can reduce long-term tax liability. This resource provides practical steps, examples, and FAQs to help you navigate farm tax rules and work effectively with your tax preparer.



SECTION 1

Defining a Farm Business

Primary Considerations

- An operation is considered a farm if it produces agricultural or horticultural products.
- To be defined as a farm business, the farm must operate with the intent to make a profit.
- The IRS has defined nine criteria upon which it evaluates whether a farm is a farm business.

Process for Getting Started



The Internal Revenue service defines a farm as an operation that produces an agricultural or horticultural product. "A farm includes livestock, dairy, poultry, fish, fruit, and truck farms. It also includes plantations, ranches, ranges, and orchards." (IRS, Pub 225)

In order to deduct any expenses, the farm must qualify as a farm business. The key feature that distinguishes farm businesses from hobby farms is the intent to make a profit. For hobby farms, the operator must report their farm income but cannot deduct farm expenses.

The IRS uses multiple criteria to determine whether the farm is operated with a profit motive. If the farm is profitable for three of the last five years, the IRS will presume a profit motive. Some horse farms can achieve this presumption with two of the last seven years. However, a farm does not need to be profitable for the IRS to determine that the operator is farming with the intent to make a profit.



The IRS uses nine criteria to evaluate the profit motive:

1. Whether the farm is operated in a businesslike manner
2. The time and effort spent on farming
3. Whether the operator depends on the farming for their livelihood
4. If losses are due to circumstances beyond the owners' control and/or are normal for a start-up farm
5. Methods evolve in an attempt to make a profit
6. If the operator and/or their advisors have sufficient knowledge to carry out farm operations
7. If the operator has made a profit on similar activities in the past
8. If (and how much) profit has been made on the farm
9. If future profits are expected from the appreciation of assets used in farming

These criteria are evaluated together, not by any individual factor alone. If the farm is judged to be a business, it is eligible to file a farm tax return (Schedule F) and associated forms, reporting income, expenses, and asset transactions. Hobby and investment farms are not eligible to deduct expenses associated with farming activities.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 1

COMMON QUESTIONS

01 Does my operation qualify as a farm business?

To qualify as a farm business, your farm must qualify as a farm and as a business. The IRS defines a farm as an operation that produces an agricultural or horticultural product. To qualify as a business, the farm must be operated with the intent to make a profit. The IRS uses the nine criteria listed above to determine if the farm is operated with a profit motive. These criteria are listed above and considered as a whole, not individually.

02 Does my farm have to earn a profit to be considered a farm business?

No, but the operator must be farming with the intent of making a profit. The nine criteria listed above are used by the IRS to evaluate that intent, even if not currently making a profit. If the farm has made a profit in three of the past five years (or two of seven for certain horse farms), it will be presumed to have a profit motive.

03 When is my operation first considered a farm business?

A farm is defined as producing an agricultural or horticultural product. Thus, the operation is first considered a farm when productive activities have started. Examples include planting one's first crop or starting to raise market cattle. Start-up expenses cannot be deducted until the business starts productive operations. A farm qualifies as a business when its operations have a profit motive.

04 What if I have agritourism, processing, or some other non-farm activity as part of my business?

A taxpayer is considered a farmer if at least two-thirds of their gross income comes from farming. A farmer qualifies for some unique provisions. If the business contains multiple activities, the taxpayer should work with their tax preparer to properly separate farm and non-farm activities.

05 What if my farm is not considered a business?

Only farm businesses are allowed to deduct expenses incurred from farming. Farms not operated with the intent to make a profit, such as hobby farms, must report farm income but are not allowed to deduct farming expenses.



SECTION 1

RESOURCES & PARTNERS

Necessary Resources

- **IRS:** Farmers Tax Guide (Publication 225)
- **Ag FTAP**: Farm Management Resources for Farmers
- **USDA**: Taxes for Farmers and Ranchers
- **USDA**: Taxes Training Videos
- **Rural Tax Education:** New Farmer Tax Information
- **Rural Tax Education:** Small Farmer Tax Guide



SECTION 2

Farm Recordkeeping for Income Taxes

Primary Considerations

- The goal of keeping farm tax records is to provide accurate, complete summaries of financial transactions so your tax preparer can prepare returns correctly.
- The cash method of accounting is most common. This method records income when received and expenses when paid without the need for accounts payable or receivable systems.
- Keep tax returns, payroll records, 1099s, invoices, receipts, and loan/asset documents organized by transaction type; records should show amount, purpose, and proof of payment.
- Maintain records for at least 5–7 years (minimum 3 years by law) to support audits and verify that all income and deductions are legitimate.

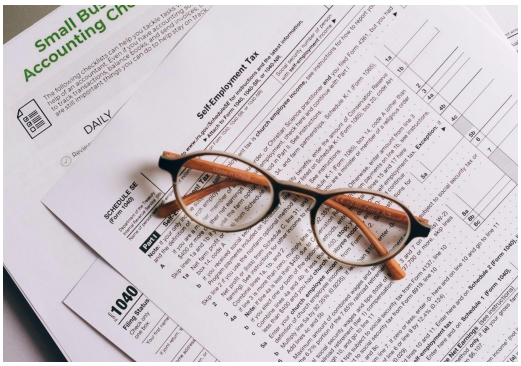
Process for Getting Started

Many people worry that keeping financial records for taxes may be complicated and even intimidating. Tax returns for farmers require accurate complete financial information, but these records are manageable for most farms. Keep in mind that the goal is to provide an accurate and complete summary of your financial records to the tax preparer so that they have the information they need to prepare your tax return.

Most farm financial recordkeeping systems are allowed to utilize the cash method of accounting. This means that income is recorded when it is available, and expenses are recorded when they are paid. No system of accounts payable and receivable is required in your accounting records.

Your financial records should include the federal and state tax records themselves, including your tax returns, payroll records, and any 1099s filed. It should also include documentation, like invoices and receipts, that support the purchases, sales, and payroll represented on your tax return. Your records should categorize income and expenses and show what, why, and how it is related to the farm. Your tax return will summarize all the transactions of the farm.





Thus, your supporting documentation should include both a summary of the transactions represented on your tax return as well as the records for each transaction. These transactions include income, expenses, loan, and asset transactions.

Documentation of these transactions might include receipts, bills, asset purchase documents, and loan agreements. These documents should show the amount of the transaction, what the transaction was for, and that it was paid. These documents can be retained as hard copies, or they may be stored in an electronic form that can legibly reproduce the documents. Your files of tax documents should be sorted by the type of transaction.

All documents should remain in your tax file for at least 5 to 7 years. The law requires you to keep your tax documents for at least three years. Audits can be conducted on returns up to 3 years after filing, but they may request documents filed prior to that date.

In an audit, you may need bank statements and transaction records, all matched up. The IRS goal is to make sure all income is reported, and all deducted expenses are business-related, so complete and consistent records are essential.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 2

COMMON QUESTIONS

01 What financial records do I need to keep for my farm taxes?

All farmers should have an accounting system that records all transactions and their purpose. Receipts and invoices for all income, expenses, loans, and asset purchases are essential. Payroll records and associated tax returns should be maintained. Farmers should also keep tax records, like tax returns and 1099s, in their files.

02 What documentation is required for each transaction?

Each record should show the amount, purpose, and proof of payment for income, expenses, loans, and asset purchases.

03 How long should I keep my farm tax records?

At least 3 years by law, but 5–7 years is recommended to cover audits and verify deductions.

04 Do I need to use accrual accounting for my farm records?

Most farms can use the cash method, meaning income is recorded when received and expenses when paid.

05 Can I store my records electronically?

Yes, as long as electronic copies are legible and can reproduce original documents if needed.



SECTION 2

RESOURCES & PARTNERS

Necessary Resources

- **IRS:** Farmers Tax Guide (Publication 225)
- **Ag FTAP**: Farm Management Resources for Farmers
- **USDA**: Taxes for Farmers and Ranchers
- **USDA**: Taxes Training Videos
- **Rural Tax Education**: New Farmer Tax Information
- **Rural Tax Education:** Small Farmer Tax Guide
- **MSU Extension:** Farm Records Book for Management



SECTION 3

Farm Income Tax Returns

Primary Considerations

- The Schedule F tax form reflects farm income and expenses. Farm income from sales of agricultural or horticultural products is reported on Schedule F. Farming expenses are deducted on Schedule F, including input costs and depreciation expense.
- Farmers are required to pay self-employment tax as well as ordinary income tax on net farm income.
- Gains on the sales of assets are taxable at ordinary or capital gains rates, but they are not subject to self-employment tax. The gain is defined as the difference between the sale price and the item's basis.
- Farmers are exempt from estimated taxes under some conditions. See your tax preparer to determine your eligibility for exemption.

Process for Getting Started



The main farm tax return is Schedule F for income and expenses, but there are a number of other tax forms needed for farms. Be sure to work with your tax preparer to provide the information that they need to prepare your taxes.

Schedule F contains information from your income and expenses. All income from sales of your agricultural or horticultural products needs to be reported on Schedule F. For purchased and resale products, the cost of purchase will be deducted, but this does not happen until the purchased or resale product is sold. Other important sources of farm income include:

- Patronage dividends from cooperatives
- Government payments
- Crop insurance proceeds
- Custom work income
- Other sources of income

For most of these sources of income, you will receive a 1099 of the type related to the payments. Examples include a 1099-G for government payments and a 1099-PATR for patronage dividends. However, it is the taxpayer's responsibility to report all income, with or without a 1099.

Expenses incurred in farming activities are deductible on Schedule F. There are approximately 20 lines of input products and services on Schedule F. Your financial records should correspond to the lines of Schedule F to facilitate taxes prepared for your farm.



Notes on certain lines of the Schedule F:

- Depreciation expense is also deducted on Schedule F. This line ties to other forms on the tax return. Your tax preparer will keep a depreciation schedule of your assets to calculate depreciation expense. Usually, depreciation takes place over a period of years, as defined by the IRS. However, Section 179 rules allow depreciation on some assets to be taken in the first year, with remaining amounts depreciated over time.
- Car and auto expenses can be calculated through mileage, but vehicles used by the farm can have their actual expenses deducted under certain conditions. Seventy-five percent of actual expenses can be deducted for any vehicle used normally during the business day for farming activities.
- Interest must be separated out of your debt payments because debt principal is not deductible for tax purposes. The underlying asset (except land) is typically depreciated over time and deducted through depreciation expense.

- Insurance that can be deducted on Schedule F is typically only crop and property & casualty insurance. Life insurance is deductible in some circumstances, and health insurance for a sole proprietor, partner, and most LLC members is deductible only on the individual tax return (Form 1040).
- Equipment leases may or may not be deductible on Schedule F. Operating leases that only reflect use of assets are deductible, but capital leases that culminate in ownership of the equipment are not always deductible. See your tax preparer to determine any specific situation.

The Net Farm Income from Schedule F, calculated as farm income less farm expenses, flows through to the individual tax return as self-employment income. In addition to the ordinary income tax that is paid on this income, the proprietor, partner, or LLC member must pay self-employment tax of 15.3% of the net farm income.

Asset sales are subject to income tax, albeit differently than net farm income. Asset sales are not subject to self-employment tax. The only portion of the asset sale that is taxable is the gain, which results from the sale price less the item's basis. Your tax preparer should maintain records of the basis of your assets on the depreciation schedule or other records. Gains on the sale of assets held for less than one year are short-term capital gains and subject to ordinary income tax rates. Gains on the sale of assets held more than one year are subject to long-term capital gains tax, which is lower than ordinary income tax rates. The sale of some depreciated assets, like farm equipment, may yield depreciation recapture, in which the asset's previous depreciation expense is "recaptured" as part of the gain on the sale.

A few farm-related expenses are deductible on the individual tax return (Form 1040). Health insurance premiums may be deductible here, as may health savings account and IRA contributions. One-half of self-employment tax is also deductible here. See your tax preparer to see how this impacts your tax return.



Farmers that have a tax liability to pay must file by March 1. Farmers that do not owe a tax liability must file by April 15. Business owners are generally required to submit estimated taxes each quarter to minimize their tax liability at tax filing. If you do not receive salaries and wages from which you have tax withholdings withheld, you may need to file estimated taxes. Farmers are exempt from these requirements under some conditions. See your tax preparer to determine the proper approach for your estimated taxes and your associated tax filing deadline.

Selecting a good tax preparer is an important part of filing your taxes. Not only do you rely on them to properly complete your tax return, but they also maintain your depreciation schedule and may track your basis on other assets. It is important to choose a tax preparer with acceptable qualifications. An Enrolled Agent or CPA can assist you more thoroughly should the IRS question your return. You should also know their experience with farm tax returns and their fee structure. You should have access to tax planning services with a philosophy similar to your own, and they need to have a process you can meet.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 3

COMMON QUESTIONS

01 When do I file my first farm tax return?

When productive operations begin with the intent of making a profit. Purchasing assets isn't enough – they must be held until productive operation begins. This could be planting your first crop or starting to raise cattle for sale. It has to be producing the product that will be sold. Growing heifers for dairy production is not productive operations, but growing heifers for sale is.

02 How do I find a good tax preparer?

Evaluate the qualifications of potential tax preparers. In particular, ask about their experience with farm tax returns. Consider using an Enrolled Agent or CPA that can assist you with IRS correspondence. Check that their philosophy on tax planning is consistent with your own. Finally, ensure that their process for managing tax filing matches your needs.

03 Is all my farm income subject to self-employment tax?

The net farm income from Schedule F is subject to self-employment tax. Asset sales, including equipment and raised adult cattle, generate taxable gains that are not subject to self-employment tax.

04 Do I have to pay estimated taxes?

If you do not have withholdings on wages, you may need to submit quarterly estimated tax. However, if two-thirds of your gross income is from farming and you file by March 1, you generally do not need to file estimated taxes. See your tax preparer to ensure you know your individual estimated tax responsibility.

05 How do nonfarm expenses or cash draws paid from the farm account impact my taxes?

Nonfarm expenses or cash draws from the farm account are not tax deductible. While they influence the cash flow of the business, they do not directly impact the farm's tax liabilities. Some personal expenses, like health insurance, are not deductible by the farm but can be deducted on the Form 1040 tax return.



SECTION 3

RESOURCES & PARTNERS

Necessary Resources

- **IRS:** Farmers Tax Guide (Publication 225)
- **IRS:** Choosing a Tax Professional
- **Ag FTAP:** Farm Management Resources for Farmers
- **USDA**: Taxes for Farmers and Ranchers
- **USDA**: Taxes Training Videos
- **Rural Tax Education:** New Farmer Tax Information
- **Rural Tax Education:** Small Farmer Tax Guide
- **Rural Tax Education:** Tax Estimator
- **MSU TelFarm:** Farm Tax Practitioners



SECTION 4

Business Structure

Primary Considerations

- Business structure affects tax reporting. Different structures determine whether income is reported on an individual return or a separate business return. Some also impact how income is taxed.
- For sole proprietorships, farm income and expenses are reported on a Schedule F that is filed with the owner's personal tax return.
- Partnerships and S-corporations are pass-through entities. They file informational returns, but the farm income flows to owners' individual returns.
- C-corporations pay corporate tax. Owners report wages and dividends on their individual tax return, separate from the profits of the corporation.

Process for Getting Started



The choice of business structure has significant implications for how farm income is reported on the owners' tax return. Certain business structures, such as partnerships and corporations, may be required to file separate income tax forms from their owners.

Sole Proprietorship

Many farm businesses owned by individuals are structured as a sole proprietorship, meaning that the individual farmer owns the farm assets and is responsible for the farm operations. Owners of sole proprietorships file **Schedule F** to report farm profit or loss, in addition to their individual income tax return.

Partnership

Jointly owned farms can operate as a partnership. All income and expenses are in the partnership's name which the partnership reports on its own Schedule F. Each partner's share of partnership profit or loss is reported on Form 1065 Schedule K-1. A partnership is considered a pass-through entity, meaning that even though a partnership is required to file an income tax return, the partnership does not typically pay income tax. Instead, the income tax is paid by each partner.

C-Corporations

C-corporations file their own corporate income tax return and are subject to corporate income tax rates. Shareholders employed by the business are taxed on their wages through their individual tax return but do not report a share of corporation income. However, shareholders may receive dividends (distributions of profit) from the corporation which are reported on their individual tax return.

S-Corporations

The S-corporation is more complicated and has more reporting requirements than a sole proprietor or partnership, but it also may have tax advantages over other business structures. An S-corporation combines the pass-through structure of a partnership with the liability protection of a C-corporation. Like a partnership, shareholders in a farming S-corporation report their wages and their share of the farm profit or loss on their individual tax return.

Limited Liability Company (LLC)

Limited Liability Companies (LLC) are often formed to reduce liability exposure to the farm owners from the farm operations while maintaining the pass-through status of a partnership. When an LLC is formed, a decision must be made to determine how it is treated for federal tax purposes. Single member LLCs can elect to be taxed like a sole proprietorship, S-corporation, or a C-corporation. Multi-member LLCs can elect to be treated as a partnership, S-corporation, or C-corporation.



SECTION 4

COMMON QUESTIONS

01 Which business structure is best for my farm?

While each business structure has different tax implications, the optimal choice for your business depends on multiple factors, like liability protection, tax flexibility, and management complexity. Sole proprietorships are simple, while LLCs and corporations offer liability protection but require more paperwork.

02 How does my business structure affect how I file my taxes?

Sole proprietors report farm income on Schedule F, which is filed with their personal return. Partnerships and S-corporations are pass-through entities, meaning the farm has its own tax return, but the net farm income flows through to owners' tax returns. C-corporations pay corporate tax separately, with owners taxed on their wages and dividends only.

03 Do I need a separate tax return for my farm business?

Sole proprietorships file Schedule F with the owner's return. Partnerships file a Form 1065 and issue K-1s to partners with their share of income and gains. Both S- and C-Corporations file their own returns, which report the related income to be recognized by the owner. S-Corporation owners may have wage and profit income, while C-Corporation owners may have wage and dividend income.

04 Do the business structures affect self-employment tax?

Yes. Sole proprietors and partners generally pay self-employment tax on net farm income. S-corporation owners may have wage income from the business but do not pay self-employment taxes on their share of the net farm income. C-Corporations are subject to corporate taxes; their owners do not pay self-employment taxes on profits.

05 Can I change my farm's business structure later?

Yes. Many farmers start as sole proprietors and later transition to an LLC or corporation as the business grows. Changing structures can have tax and legal implications, so consult a tax professional before making changes.



SECTION 4

RESOURCES & PARTNERS

Necessary Resources

- **IRS:** Farmers Tax Guide (Publication 225)
- **Ag FTAP:** Farm Management Resources for Farmers
- **USDA**: Taxes for Farmers and Ranchers
- **USDA**: Taxes Training Videos
- **Rural Tax Education**: New Farmer Tax Information
- **Rural Tax Education**: Small Farmer Tax Guide



SECTION 5

Income Tax Planning

Primary Considerations

- Tax planning is essential every year, not just in profitable years, because it helps maintain consistent taxable income and reduces long-term tax liability.
- Income and expense timing are primary tools for tax management. Deferring crop or livestock sales and prepaying expenses can help balance income and deductions across years.
- Depreciation strategies offer flexibility, but overusing accelerated depreciation can create future tax burdens alongside debt payments.
- Additional options exist after year-end to fine-tune tax liability, but the optimal strategy usually involves a combination of advanced planning and tax time decisions.

Process for Getting Started



One of the only certain things about farming is that the income tax deadline will come every year. Between federal and state income taxes and self-employment tax, prospects of a large tax bill can feel overwhelming. Year-end tax planning can address this concern and is an essential tool for farm financial management.

We tend to think that tax planning is only necessary in good years. However, a better tax planning strategy is to maintain consistent taxable income across the years. This minimizes taxes owed over a longer span of years. Thus, farmers can benefit from tax planning in moderate and poor years too.

Maintaining a level taxable income is often a wise long term tax management strategy. Managing taxes in a high-income year can reduce your tax liability. Tax planning can also be advantageous in low-income years. Planning helps to maintain a stable taxable income over time and avoid tax losses that have limited long-term benefit. Your tax preparer can help you plan a target net farm income to maintain consistent total tax liability.

The primary tools in year-end tax planning are income timing, increasing or decreasing expenses, and managing depreciation. Crop and livestock sales may be most effective in managing an increase or decrease in income. Deferring income commonly refers to carrying over crops or livestock for sale to the next year and is a common method to reduce taxable income. Remember that income is recognized when funds are available to your farm, not when the check is cashed.

Managing expenses should first be done with cash options. Prepaying expenses during a production year can allow you to reach a target balance of income and expenses. Prepaying not only increases cash expenses in this year but may also allow discounts on next year's inputs. Managing the timing of common bills, such as insurance premiums, rent, or interest, can optimize the current year's expenses as needed. Remember that expenses can only be recognized when payment is extended to a vendor. Purchases made "on account" are not deductible.

Accelerated depreciation can provide flexibility, allowing assets to be purchased when they are most advantageous to your overall financial condition. Available depreciation options allow many asset purchases to be depreciated entirely or in large part for the current tax year. While accelerated depreciation can significantly reduce taxable farm income, relying too heavily on it can leave you with a large tax liability on top of debt payments in future years.

Even after year end, a few tools exist to further refine your tax liability. Contributions to personal IRAs and health savings accounts (HSAs) are not due until the April tax deadline. Depreciation decisions can also be made when preparing the tax return. In addition, farm income averaging is a tool that your tax preparer can use to reduce federal income tax. If negative or extremely low self-employment income is unavoidable, you or your spouse may still want to pay enough to gain credits for social security.

Although year-end tax planning takes some effort, it is an important tool to reduce your long-term tax liability. Work with your tax preparer to develop a plan that is right for your farm. More information about farm income taxes can be found at the IRS website.

Disclaimer: For a specific list of resources in the above description, view the Necessary Resources area of this section.



SECTION 5

COMMON QUESTIONS

01 What is the benefit of tax planning in years that did not have high profit?

Managing a level taxable income across years is often the best strategy to minimize tax liability over the long term. While some losses may be able to be carried over to future years, often some of the benefit will be lost with that strategy. Negative self-employment income cannot be carried over, so that potential tax savings is forfeited. In addition, the self-employed health insurance deduction requires positive net income for the business.

02 Can I prepay expenses for the next crop year to reduce my tax liability?

Prepaying expenses is a common tax management tool. Many farmers prepay for seed, fertilizer, or feed to manage taxable income. The IRS generally limits prepaid expenses to 50% of other deductible farm expenses. A business purpose beyond tax avoidance is required for all prepaid expenses.

03 Can I ask a buyer to delay their payment until after the first of the year in order to avoid recognizing that income?

Sales income can be deferred until the next tax year only if the contract states that the funds shall be paid in the next tax year and the funds are not made available in the current year. This must align with normal crop sales practices and not solely to avoid tax.

04 Are products I purchased “on account” with a vendor deductible as expenses in the current tax year?

Only products purchased in cash or through a third-party creditor are deductible in the current tax year. Purchases made “on account” with a vendor are not deductible until payment is made to the vendor.

05 Can I purchase a piece of equipment in order to increase depreciation in the current year and reduce my tax liability?

Equipment placed in service in the current tax year are depreciable to some extent in the current tax year. Standard MACRS depreciation allows partial depreciation based on the purchase date and type of equipment. Section 179 depreciation and bonus depreciation commonly allow accelerated depreciation in the year of purchase. Check with your tax professional for your specific situation.



SECTION 5

RESOURCES & PARTNERS

Necessary Resources

- **IRS**: Farmers Tax Guide (Publication 225)
- **IRS**: Choosing a Tax Professional
- **Ag FTAP**: Farm Management Resources for Farmers
- **USDA**: Taxes for Farmers and Ranchers
- **USDA**: Taxes Training Videos
- **Rural Tax Education**: New Farmer Tax Information
- **Rural Tax Education:** Small Farmer Tax Guide
- **Rural Tax Education**: Tax Estimator
- **MSU TelFarm**: Farm Tax Practitioners
- **MSU TelFarm:** Tax Planning Resources

Partners

- MSU TelFarm
- Internal Revenue Service
- USDA
- Rural Tax Education

Chapter:

Urban Farming



Keep Growing Detroit *distributes transplants and seeds to over 2,200 urban farms, gardens, schoolyard gardens and community gardens in Detroit, Hamtramck and Highland Park. Edible Flint, Growing Hope in Ypsilanti and the Greater Lansing Food Bank offer similar resources in their communities.*

AUTHORS & INSTITUTIONS

Naim Edwards, MSU Extension and Detroit Partnership for Food Learning and Innovation
Mariel Borgman, Community Food Systems Educator, MSU Extension
Katie Brandt, MSU Organic Farmer Training Program, MSU Extension

SECTIONS

Section 1: Planning for Urban Farms

Section 2: Urban Farmland

Developed by:

MICHIGAN STATE UNIVERSITY | Extension

USDA

Sponsored by:

GreenStone® FARM CREDIT SERVICES



Detroit Partnership for Food Learning and Innovation *focuses on growing perennials and fruits, but also has native plants, beehives, a pizza oven and a classroom.*

INTRODUCTION

Urban Agriculture is generally defined as the production of food in places with dense populations and higher rates of impervious surface surrounding the production area. This broad sector of food production ranges from traditional farming practices of growing crops in soil in an open field to more intensive often indoor production models such as aquaponics or vertical farming under lights. Although many grow fruits and vegetables and raise animals in cities, fewer practice it as a livelihood, business, or for subsistence. This chapter is intended for those trying to practice urban agriculture at a scale capable of making a living or growing enough to significantly offset food purchasing costs.

This resource guide has the following sections to help you get started with urban farming.

- **Planning for Urban Farms**
- **Urban Farmland**

When embarking on an urban agriculture journey, one must first identify what she wants to grow. This will inform where and how she wants to establish her farm operation. These decisions will likely be influenced by access to capital and resources. For the sake of simplicity, we will assume the grower wants to cultivate land to grow a vegetable crop. Once land in or near a city is identified, the farmer should either buy the land or establish a legal agreement for how the land will be used. Furthermore, understanding zoning policies is critical to ensure that agriculture is in fact permitted on the land. If it is not, efforts (possibly extensive) must be made to change the zoning or get *conditional use* of the land.



Youth can plan and plant gardens! This garden was created by participants in Growing Hope's Youth Apprenticeship Program.

Examining the site's history is also critical as knowing how the site has been managed over decades can inform what the soil is like and whether the risk of contamination is high or low. Once land is selected and the farmer can legally use it, the land should be registered with the Farm Service Agency to get a farm number and tract. This will directly connect the farm and farmer to the USDA and additional government programs, funding, and resources.

Primary considerations

- Weed management
- Pest Management
- Markets
- Storage
- Distribution
- Labor

How To Get Started

The best way to get your start in urban agriculture is to **connect with urban farms** in your community! Detroit is a national leader in urban farming and gives you dozens of options of farms where you can work, volunteer, visit or take a class. In a city like Lansing, Kalamazoo or Grand Rapids, you'll have several urban farms to visit. In some of the smaller cities in Michigan, you may be breaking new ground! If there aren't urban farms in your community you might want to connect with local farms outside the city limits or network with urban farmers in another city.

Once you've built some farm skills and have seen some models of urban farms, you'll want to start planning for your own farm, seeking land and getting ready to plant! This guide offers three sections to help you make the decisions and follow the steps to get growing on your own farm.

- Planning for Urban Farms
- Urban Farmland
- Growing!

A few online resources that are a good starting point might be MSU Extension's Urban Farming website, beginning farmer website and Map of Michigan Beginning Farmer Resources. If you're teaching beginning farmers, you might want to begin with the Michigan Beginning Farmer curricula on Urban Ag & Policy, D-Town Farm Leading with Values or Land Access for Urban Farms,



Inspired by a lack of fresh food options in the Battle Creek neighborhood where he grew up, Devon Wilson founded Sunlight Gardens after volunteering at a local urban farm and taking the MSU Organic Farmer Training Program

Soil:
The farm's soil or areas where production will occur should be sampled and submitted for testing to understand soil attributes and check for levels of contamination. Understanding a soil's texture, pH, organic matter and other attributes will inform how to best manage soil for optimal production. Once results are analyzed, consider how the present soils will affect your desired cultivation goals. If the soil test results indicate significant measures are needed to amend soil:

- Consider the costs and time needed to amend for your desired plants
- Are there other plants that could grow in the soil as is?
- What resources do you have to manage soil? Tractor, compost, fertilizer, other amendments? What nutrients are in excess or lacking?

Soil contamination is another potential issue. If soil is contaminated, how is it contaminated? Generally, it is best to test for lead, arsenic, and petro-chemicals based on the history of the site and many urban landscapes. Contamination levels will also influence what can or should be grown or if growing should occur at all. In general if soil is contaminated, avoid cultivating root vegetables or crops that are known to uptake certain contaminants. Also, creating safety measures to contain and minimize exposure to dust from soil disturbance. Adding mulch, weed fabric, leaf litter, woodchips, etc. can neutralize the risk of soil contaminants getting into the air and onto plants.

Bone meal and other calcium based soil amendments have demonstrated a reduction and the bioavailability of lead. Phytoremediation or soil removal are other options that require consideration for where soil or plant material is disposed of. Some farms have displaced contaminated soil and plants to a perimeter berm not used for cultivation. The berms can then serve as a barrier or water retention method, but moving and replacing soil can be cost prohibitive.

I have tested with the organizations listed below:
https://soilhealthlab.cals.cornell.edu/testing-services/
https://ag.umass.edu/services/soil-plant-nutrient-testing-laboratory
https://algreatlakes.com/pages/soil-analysis



Learning by doing! Hands-on farming is the best way to grow your farming skills.

SECTION 1

Planning for your Urban Farm

The steps in planning for urban farms are:

- **Gaining skills** by gardening, working for a farm, taking a class or visiting farms
- **Deciding on a type of farm** such as a farm business, schoolyard garden, homestead, non-profit community farm or other venture
- **Writing a Farm Plan**
  - Values & Goals
  - Farm Plan Outline draft
  - Soil Management Plan
  - Site Plan
  - Crop & Production Plan
  - Marketing Plan
  - Labor Plan
  - Startup Budget & Resource List
  - Financial Plan/Sustainability Plan
  - Farm Plan!!!

Remember that the farm plan is a living document! It will change over time and through trial and error as you grow your farm.



Examples of Farm Plans written in the MSU Organic Farmer Training Program



*The Annual **Flint Food Garden Tour** is one way that people can see urban farms, community gardens and other growing spaces in the city. The bike tour in 2025 was a chance to see innovative raised beds at Edible Flint.*

SECTION 1

COMMON QUESTIONS

01 How do I grow my skills for starting an urban farm?

Gardening in your yard, in containers or at a community garden for a few seasons before starting your urban farm can help you plan for your farm & gain much-needed growing experience. Look for local organizations that might help by offering seeds, transplants, lead testing or other support!

Working on a farm is a fantastic way to build skills. Find farms to work on by visiting the MSU Sustainable Farm Jobs & Opportunities website, by talking to farmers at a farmers market or by emailing or calling farms you find online.

Taking a class can be excellent as well. For example, in Detroit, you might start by taking Urban Roots at Keep Growing Detroit, then take a fruit class at Detroit Partnership for Food Learning & Innovation, followed by taking the MSU Organic Farmer Training Program at Keep Growing Detroit.

Visiting farms can help SO MUCH by giving you examples of how build raised beds, design a space to wash produce, access water or grow your crops. It can also start to build your network of farmers you know. Detroit, Lansing, Flint and other cities in Michigan often have an annual garden tour where you can drive, bike, walk or ride a bus to different farms and gardens.

02 What kind of farm should I start?



Brenda Mae Sharpe of The Foster Patch *manages a homestead in her yard, as well as a community garden across the street and a farm business behind her home.*

Each farm is unique! You'll want your farm to align with your values and goals, the land you're growing on and your communities needs.

Urban farms can take many forms! You might start:

- **Farm Businesses** focus on growing and selling farm goods and services
- **Community Farms** are non-profits
- educational gardens or community gardens
- **Homesteads** grow mainly for home use
- **Other**: Combine farm types from above or create your own vision!

03 Who can help me write a Farm Plan?



Janie Beuthin *took an online class, the Floret Flower Farming Workshop, to make a plan for* ***Twig End Farm*** *in her backyard 1 sidelot in Flint*

There are a few helpful tools for writing a farm plan.

- **AgPlan** is a free online tool for writing a farm business plan
- Take the **MSU Organic Farmer Training Program**
- Take a **business planning class** like Grand Rapids Opportunities for Women classes
- Work with the MSU Product Center or use the Selling Food in Michigan guide if you planning for value-added goods like salsa, skin creams or a food truck
- **Find a mentor** through SCORE or TOPP
- **Take an online course**
- **Use AI** to "Write a business plan for an urban farm that sells _____ in _____ City" and then tweak it to your preferences.

04 What are the parts of a farm plan?

Start with a Farm Plan Outline and then think through each section. You might choose to include:

- **Values & Goals**! It is extremely important to start here! Take time to consider the values you want to center on your farm and create a timeline of short-term and longer-term goals for the farm. Give yourself plenty of time and flexibility on the goals! And try to collaborate with any business partners, community stakeholders or family members to get their input as well.
- **Soil Management Plan** includes info on your lead test results and a plan for starting new growing beds, amending the soil and the steps for tillage or no-till bed prep
- **Site Plan** - is a map showing your growing spaces, hoophouse(s), tools shed, water access, and other features of your farm
- **Crop & Production Plan** shows your seed order, crop varieties, planting dates, and where you'll plant each of your crops
- **Marketing Plan** shows your plan for selling or donating crops. List the farmers' markets you'll attend, hours for your onsite Farm Stand or U-Pick, restaurants you'll sell to or pantries you'll donate to
  - This might be a **Community Engagement Plan** for a community farm or a **Self-Sufficiency plan** for a homestead
- **Labor Plan** show who will work at what tasks, their experience, job descriptions and pay. Including information on farm safety and farmer work/life balance can help the farm thrive.
- **Resource List** shows what tools, skills, soils, community resources and allies you have.
- **Startup Budget** lists all the income and expenses for one to three years
- **Financial Plan** adds Cash Flow, Balance Sheet and Enterprise Budgets to your startup budget
- **SWOT analysis** shows your strengths, weaknesses, opportunities and threats
- Your complete **Farm Plan** brings together all the sections you've written!



An example of a site plan created by Angela Lugo-Thomas for a farm in Highland Park



RESOURCES & PARTNERS

Soil Testing

https://soilhealthlab.cals.cornell.edu/testing-services/
https://ag.umass.edu/services/soil-plant-nutrient-testing-laboratory
https://algreatlakes.com/pages/soil-analysis

Farm Planning Templates

- AgPlan from the University of Minnesota
- SARE Building a Sustainable Business book
- MSU Center for Regional Food Systems - Loan Readiness Toolbox for Food and Farm Businesses Business Plan Template
- Organic Farmer Training Program - Farm Plan Template
- SCORE Business Plan Template for a Startup Business
- Small Business Development Center Traditional business plan format or Lean startup format
- Canva- search "business plan" in the Templates section to choose from many customizable templates
- Artificial Intelligence - Use AI by prompting it to "Write a business plan for a farm in (place) that grows (product mix). Be certain to read and then prompt with new features or edit!



Drew Farm grows on land at a Detroit Public School that was once a football field.

SECTION 2

URBAN FARMLAND

As you begin to look for farmland, think through what kind of land you need for the farm you want. Michigan has excellent examples of what an urban farm can be. Check out how farm goals and farmland weave together:

Classes, Workshops & Peer-to-Peer Learning Communities

- Edible Flint - Land is near downtown Flint, museums & public library with space for community gardens, shared growing, orchard & events.
- DP-FLI (MSU Detroit Partnership for Food Learning & Innovation) - Land includes a heated classroom, fruit plantings, permaculture.
- MSU Organic Farmer Training Program - collaborates with Detroit, Grand Rapids & East Lansing farms. OFTP doesn't have its own farmsite & benefits greatly from teaching at multiple independent farms.

Collaborative Marketing & Grower Resources

- Keep Growing Detroit -adjacent to Eastern Market, where KGD runs a collaborative market stall, called Grown in Detroit. The farmsite is set up for hosting events, gardening classes and growing transplants for 2,200+ farms & gardens in Detroit, Highland Park and Hamtramck.
- Detroit Black Community Food Sovereignty Network & D-Town Farm grows on 7 acres. Challenges like lack of electricity and water are solved with solar panels, a pond and a windmill. This economic self-determination and community interdependence is integral to their national leadership in confronting racism in the food and farm system. Their second site is the Detroit People's Food Cooperative!

Non-profits supporting urban farmers & gardeners:

Primary Considerations

- Land access through Land Bank or landowner partner organizations
- Water Access
- Neighbor support
- City regulations
- Support for urban farmers
- Breaking down barriers for farmers of color, women, farmworkers, lower-income people and others

Process for Getting Started



Keep Growing Detroit's land access guide

Example land access process when working with the Detroit Land Bank:

1. Choosing a site.
2. Talk to the community.
3. Identifying ownership.
4. Applying.
5. Closing.
6. Reporting.
7. Garden permit.

Urban land access differs greatly from city to city! There is a **clear path to access land shown in these City Guides for Detroit, Highland Park, Hamtramck, Lansing and Flint**. City lots in Grand Rapids, Traverse City and Ann Arbor are rare and extremely expensive and there is no process to access vacant lots. Many other Michigan cities lie somewhere in between.

Reach out to ask about the local land access process if you have urban farmers or a non-profit working with urban gardeners and farmers in your community. If your city or town doesn't have any urban farmers or community gardens, **create your own City Guide**. You can reach out to community leaders and share your idea! If the first few people you contact are not helpful, keep trying until you find an ally in the governments, schools, not-profits, neighborhood organizations, businesses or among neigbors.



Can you grow on a parking lot? Yes! Urban Canopy Farm in Chicago answers questions from Michigan growers.

SECTION 2

COMMON QUESTIONS

01 How can I find vacant lots in my city?

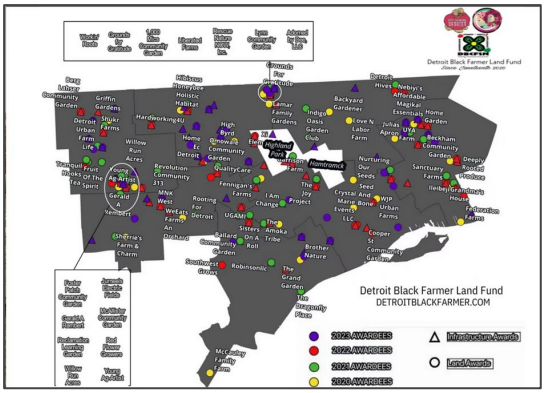
Check with the local Land Bank:

- Detroit Land Bank Authority - Activating Vacant Land
- Highland Park Land Purchase Procedures and Land Purchase Application
- Ingham County Land Bank
- Genesee County Land Bank
- Calhoun County Land Bank
- Michigan Association of Land Banks

In other regions, you can search for similar terms online:

- "zoning map for the city of _____"
- "zoning ordinance for _____ city/township"
- "change of use form for farms in _____city"
- "land bank for _____ city/township/county"
- "vacant land purchase application for _____ city"

02 What are the steps to access vacant lots?



Detroit Black Farmer Land Fund has helped farmers all over the city complete the steps to access land.

A good place to start is to look for an urban ag non-profit or BIPOC farmer land fund in your region to support you as you seek land.

After that, here is an example land access process for working with the Detroit Land Bank:

1. Choosing a site.
2. Talk to the community.
3. Identifying ownership.
4. Applying.
5. Closing.
6. Reporting.
7. Garden permit.

03 How can I connect with neighbors positively?



1. **Talk** to neighbors before starting the farm.
2. Put up **signs** to welcome people onto the farm, to explain if visitors can harvest crops and how to get involved.
3. **Welcome the community** for events, volunteering, youth programs, etc.
4. Sell or give away produce on-site or host a farmers market, food pantry of free lunch program to bring **food** into the community.
5. **Listen!** Ask for suggestions and try to follow advice of neighbors as often as possible.
6. **Be creative!** What would be appreciated in your neighborhood?

04 How can I get water?



Jon Kent of Sanctuary Farm in Detroit created the Detroit Water Consortium to get farmers the water they need.

It can be expensive to get water in the city… here are options to consider:

- Water catchment - add gutters to a hoophouse, a building with a metal roof or build a structure to catch rainwater.
- Use water from a neighboring home or business. A low cost hose meter can help you to pay your share of the water bill without the expense of a full water meter.
- Connect to city water with full water & sewer connection or with a "Wabash Box" to just connect to city water
- Ask the fire department about filling water totes from a fire hydrant

Food Safety - if using rainwater catchment or any water stored in a tote or container, you should use drip or put water on the soil (not edible plant parts)

Sewer charge discounts - Many cities offer a discount to gardeners so they aren't paying sewer fees for water that is absorbed into gardens

05 What regulations do I need to know about?

Zoning

- City of Detroit: Check Land Zoning and Zoning District Classifications
- Search for "zoning map for the city of _____" and "zoning ordinance for _____ city/township"

Change of Use Forms - You might need to fill out a form to garden or farm in cities, which are usually zoned 'residential' or 'commercial', rather than 'agricultural'

- "change of use form for farms in _____city"
- Detroit Change of Use Process

Mowing Enforcement - the city might have a fine for crops taller than unmowed grass. Try to find your local rules before you have a ticket.



MSU Detroit Partnership for Food Learning and Innovation

RESOURCES & PARTNERS

Urban Land Access

local Land Banks (Michigan Land Bank Association

Detroit Land Bank Authority - Activating Vacant Land

Highland Park Land Purchase Procedures and Land Purchase Application

Ingham County Land Bank

Genesee County Land Bank

Calhoun County Land Bank

Michigan Association of Land Banks

City Guides

City Guides for Detroit, Highland Park, Lansing and Flint or to create your own city guide

Urban Land Access Curriculum

https://www.beginningfarmercurriculum.org/land-access

Zoning and Regulations

- City of Detroit: Check Land Zoning and Zoning District Classifications
- Search for "zoning map for the city of _____" and "zoning ordinance for _____ city/township"

Change of Use Forms -

- Search for "change of use form for farms in _____city"
- Detroit Change of Use Process

BIPOC Farmer Land Funds

Detroit Black Farmer Land Fund https://www.detroitblackfarmer.com/

Washtenaw County Black Farmers Fund https://www.wcblackfarmers.fund/

West Michigan Farmers of Color Land Fund https://www.wmlandfund.org/

Urban Farms & Advocacy Organizations

Detroit

- Keep Growing Detroit
- Detroit Black Farmer Land Fund
- Detroit Black Community Food Sovereignty Coalition

Grand Rapids

- New City Urban Farm

Lansing

- Sunlight Gardens

Flint

- Edible Flint

Battle Creek

- Sunlight Gardens

Kalamazoo

- Zoo City Food and Farm Network

There are too many great farms to list them all....

Index Coming Soon!
(*2026 Update*)