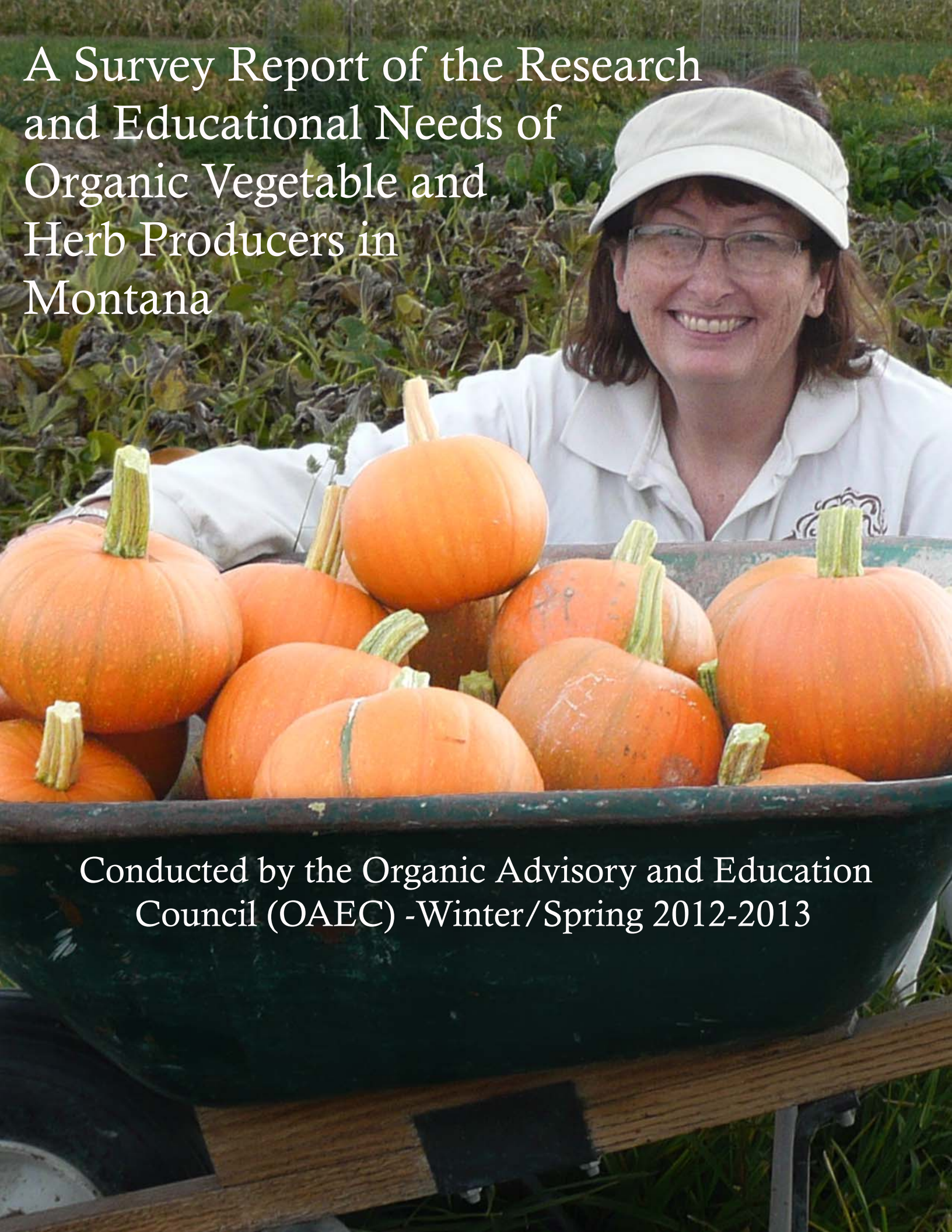
A Survey Report of the Research and Educational Needs of Organic Vegetable and Herb Producers in Montana



Conducted by the Organic Advisory and Education Council (OAEC) -Winter/Spring 2012-2013

Report on the Survey of Research and Educational Needs of Organic Vegetable and Herb Producers in Montana

Conducted by the Organic Advisory and Education Council (OAEC) in the winter/spring of 2012/2013

The Organic Advisory and Education Council is a 501(c)(3) nonprofit organization, that encourages sustainable and responsible organic agricultural practices, through investments in research and education.

Organic Advisory and Education Council
762 Danvers Rd
Lewistown MT 59457
406-538-3607
mtoaec@hotmail.com

Cover Photo by Steve Baril of Cindy Baril with Pumpkins at Harvest
Rear Cover Photo by Steve Baril of Squash Flower

Table of Contents

INTRODUCTION

This report is the result of a survey of organic vegetable, herb, and row crop producers conducted by the Organic Advisory and Education Council (OAEC). The intent of the survey was to determine the greatest challenges growers face with organic production and marketing and to survey growers' needs for education and research. The results will help the OAEC to identify and steer future research and education toward the most challenging issues. The results may also be useful to researchers and educators in supporting programs, research, and requests for funding.

METHODS

The survey questions were drafted by the OAEC Board of Directors and they closely followed the format of a survey of organic grain producers conducted by the OAEC in the same time frame. The grain survey was reviewed by several faculty members at the Montana State University, College of Agriculture.

The survey had 49 questions and was divided into nine sections that addressed the operation in general, crops produced, green manure and cover crops, weeds, diseases, pests, soil nutrition, marketing, and summary. The final survey document is attached to this report as an appendix.

The survey was mailed in 2012 with an enclosed return envelope to 50 producers of organic vegetables, herbs, and other row crops (such as flowers and seed crops). Recipients included 49 Montana-based producers and one Wyoming-based producer who received certification services from a Montana-based certifier.

Information from the National Organic Program website was helpful in identifying producers. Accredited organic certifiers assisted with contact information. The Montana Sustainable Growers Union provided contact information for its members. This Western Montana marketing group supports production practices that are consistent with organic principles. The OAEC made follow-up phone calls to encourage completion of the survey and in several cases the survey was re-mailed.

RESULTS AND DISCUSSION

Getting farmers to respond to a survey is a challenge, as producers are frequently asked to complete detailed surveys for crop, acre, and production estimates and other food and agricultural data. For this survey, 21 completed surveys were received, a 42% return rate. Results from the surveys are presented below. Each survey question is restated in the order that it appeared in the survey document with the summarized responses and discussion following each question. A blank copy of the survey is attached as Appendix 1.

SUMMARY

A 2012 survey assessed the research and education needs of producers of organic vegetables, herbs, and row crops in Montana. Twenty-one surveys were returned from 50 sent (42%). Seventeen surveys were from growers located in intermountain counties of Western Montana. Years of experience in organic production ranged from one to >20 years (median 11 to 20 years). The median cultivated area was one to ten acres, and none were larger than 100 acres. All producers grew vegetables, 81% grew herbs, 48% flowers, 43% seeds, and 29% grew bedding plants. Nearly all crops were grown with a degree of success; some difficulty was reported in growing *Brassicae,* corn, cucumbers, eggplant, and berries. The three most challenging agronomic issues were weeds followed by weather then insects. Weeds were the top factor affecting yields followed in order by seed varieties, pests, and soil fertility.

The details of crop rotations varied highly among producers. The length of rotations ranged from two to six years. Related families were often rotated together. Details of crop rotations were influenced by soil fertility, weed pressure, relationship to prior crops or families, and disease or pest pressure. Most rotations included a cover or green manure crop, and common crops were peas, buckwheat, clover, rye, and oats. The yearly amount of land in green manure or cover crop ranged from <10% to >50% (median 20 – 30%). Benefits of green manure and cover crops were to improve soil fertility and structure, control weeds and pests, and reduce erosion. Green manure and cover crops were often seeded late in the season resulting in poor stand establishment. Cultivation and mowing were used to terminate green manure and cover crops, and most growers had no problems with termination.

The most reported perennial weeds were field bindweed, quack grass, and Canada thistle; and these were considered impossible to control by some producers. The top two reported annual weeds were mallow and pigweed. Crops most influenced by weeds were alliums, carrots, herbs, asparagus and berries. Tomatoes, potatoes, alliums and squash were most reported as influenced by diseases. Powdery mildew and scab were the most commonly reported diseases. The top pests were flea beetles, aphids, imported cabbage worms, and grasshoppers with some reports that flea beetles and grasshoppers were impossible to control. The crops most affected by pests were *Brassicae* and potatoes. Suggestions for research into weed, disease, and pest management were mostly for specific species such as bindweed, scab, powdery mildew, flea beetles, and root maggots. Others suggested research on rotations and cover crops to manage weeds and diseases and that research take into account Montana's climate.

Sixty-six respondents (76%) did soil or foliar fertility testing, and a majority tested all fields at one to four year intervals. Five producers did no testing, but may have relied on crop observation, field history, and crop type for fertility information. Nine producers knew of fertility deficiencies, and the most common deficient nutrients were phosphorus, nitrogen, and sulfur. The two most common ways to correct fertilizer deficiencies were by incorporating green manure or livestock manure.

Producers reported some success in marketing all types of crops. The easiest to market were chard, corn, and beets; and the hardest were herbs, potatoes, seeds, and flowers. Many growers tried multiple marketing strategies. The most common strategy was farmers' markets followed by direct to retailers, wholesale, and community supported agriculture. A majority of producers

reported the availability of accessible markets, but 24% said that markets were under developed. Two reoccurring suggestions for market development were to educate consumers about organic food and develop processing facilities.

Surveys included 32 suggestions for research and education. Two common suggestions were assistance with developing organic markets including consumer education and control of perennial weeds such as bindweed, quack grass, and Canada thistle. A suggestion and a theme throughout the surveys was to gain an understanding of green manure and cover crops for building soil and managing weeds, diseases, and pests. Another suggestion was the control of pests in controlled environments such as hoop houses.

ACKNOWLEDGMENTS

The Organic Advisory and Education Council (OAEC) acknowledges organic vegetable, herb, and row crop producers for their work in and contributions to organic agriculture and thanks those that completed the survey.

Faculty members at the Montana State University, College of Agriculture, Dr. Patrick Hatfield, Professor Perry R. Miller, Professor Bruce D. Maxwell, Associate Professor Clain A. Jones, and Associate Professor Fabian D. Menalled reviewed a draft survey of grain producers that formed the basic format for the survey of vegetable, herb, and row crop producers.

Charles Holt, Production Coordinator for Towne's Harvest Farm, Montana State University, reviewed the draft report.

The OAEC Board of Directors was responsible for the survey and final report. Directors were Ole Norgaard, Chair; Sam Schmidt, Vice Chair; Catherine Odden, Treasurer; Lise Rousseau, Secretary; Steve Baril; Jan Boyle; Wes Henthorne; Daryl Lassila; Warren Lybeck; and Ty O'Connor.

General Questions

Question #1: What county or counties do you primarily operate in?

Organic vegetable, herb, and row crop operations are predominantly located west of the Continental Divide and intermountain counties of Western Montana.

Seventeen of the 21 completed surveys were from operations in counties located in the intermountain areas of Western and Southwestern Montana. Eleven of these were from operations located west of the Continental Divide (see Table 1). Only three surveys were returned from operations located in the plains area east of the Rocky Mountains. Because of this distribution, survey results are probably more representative of conditions in the western intermountain areas of Montana. No conclusions are possible regarding conditions in the plains of Central and Eastern Montana, because survey results were too few and inconsistent for this region.

Table 1. Numbers of producers receiving surveys and numbers of surveys returned by county

County	Surveys Sent	Completed Surveys Returned
Cascade	1	1
Chouteau	1	0
Dawson	1	1
Flathead	2	2
Gallatin	9	4
Lake	8	2
Lewis & Clark	1	1
Lincoln	1	1
Madison	1	0
Missoula	5	1
Park	6	1
Ravalli	8	3
Sanders	3	2
Sublette (Wyoming)	1	1
Sweetgrass	1	0
Teton	1	1
TOTALS	50	21

Question 2: How long have you been growing organic crops?

1. **Now in transition**
2. **1-3 years**
3. **4-6 years**
4. **7-10 years**
5. **11-20 years**
6. **>20 years**

Eleven to twenty years was the median bracket of organic farming experience for survey respondents (see Table 2). Four growers had three or less years of experience. Nine growers had more than 20 years of experience.

Table 2. Number of years of organic farming experience for survey respondents

Years of Organic Farming Experience	Number of Responses (Growers)	Percent
Transition	1	5
1 – 3 Years	4	19
4 – 7 Years	4	19
7 – 10 Years	1	5
11 – 20 Years	2	10
More Than 20 Years	9	42

Question 3: Is your farm all organic or mixed organic and non-organic?

1. **All Organic**
2. **Mixed**

Eighteen (86%) of the farms were reported as all organic, and three (14%) consisted of mixed organic and non-organic production.

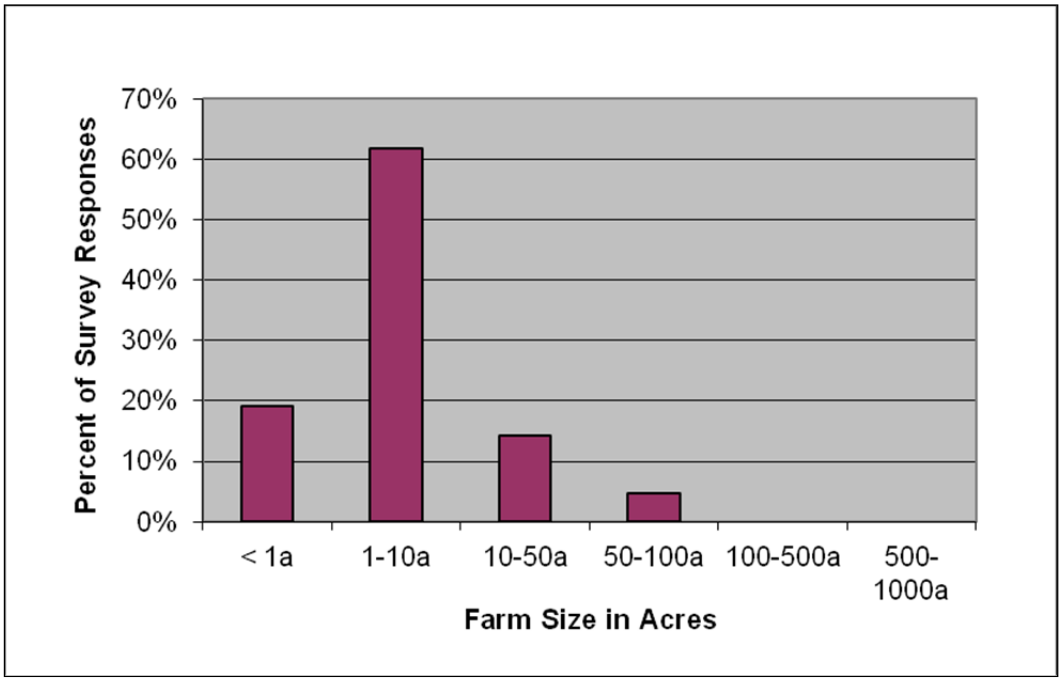
Question 4: How large is your organic production area?

1. **Less than one acre**
2. **1-10 ac**
3. **10-50 ac**
4. **50-100 ac**
5. **100-500 ac**
6. **500-1000 ac**
7. **1000-2000 ac**
8. **2000-5000 ac**
9. **>5000 ac**

Survey results show that organic vegetable and herb production occurred on small scale operations. The median sized operation was 1–10 acres. Four operations were less than one acre, 13 were 1–10 acres, 3 were 10–50 acres, and 1 was 50–100 acres. None were reported greater than 100 acres. Figure 1 shows the percentage of survey respondents in each category of organic production area.

Many farms produce for local, small scale retail markets such as farmers' markets and community supported agriculture as is addressed later in this report. The existence of wholesale marketing, bulk processing facilities, and associated production is all but undeveloped in the region. These factors contribute to the relatively small size of these organic farms.

Figure 1. Size in acres of organic vegetable and herb farms and the percent of survey respondents in each size category



Question 5: What is the primary make up of your soil structure?

Producers reported a variety of soil types as follows:

Silty loam	4 surveys
Clay loam	4 surveys
Sandy, gravelly loam	4 surveys
Loam	2 surveys
Sandy Clay	2 surveys
Clay	1 survey
Other	3 surveys
No Response	1 survey

Growers working with more challenging soil types such as clay and sandy clay were more likely to report soil building activities such as addition of compost, manure, and mulch in their responses to survey questions addressing these activities.

Question 6: What tillage practices are most effective in managing soil conservation?

Organic standards require growers to implement tillage practices that maintain or improve soil condition and prevent erosion. Table 3 lists the kinds of tillage practices reported by organic farmers as elements of soil conservation management. Some surveys reported more than one tillage practice, so totals exceed 100%.

Table 3. Tillage practices used on organic farms to manage soil conservation

Tillage Practice	Number and Percent of Growers Reporting Use of the Practice
Reduced tillage	10 (48%)
Cover crops	10 (48%)
No-till	4 (19%)
Soil amending	4 (19%)
Crop rotation	3 (14%)
Green manure	2 (19%)

"Reduced tillage" was also reported as "minimum till." Three surveys described elimination of fall tillage to reduce wind erosion. Specific practices included tillage with a spader, chisel plow, and shallow tillage. The spader and chisel plow were viewed as being less disruptive of soil structure than other implements such as rototillers or moldboard plows. One grower reported that weed management practices did not include tillage.

"Cover cropping" was described as a tillage practice on ten (48%) surveys. This soil conservation practice was reported to keep the soil covered and to minimize erosion with a net effect of reduced tillage.

"No-till" was described on one survey as "no plowing or rototilling" and another survey described no-till for raised bed production. For surveys reporting no-till, it was not clear what practices were employed for procedures that usually involve tillage such as preparation for seeding.

"Soil amending" included tillage to incorporate compost, mulch, manure, or sand. Layering of soil and amendments (lasagna method) to build soil was described for a raised bed system.

"Crop rotation" was reported on one survey as a practice to rest fields for one or two years without tillage. Another survey said that rotation included livestock grazing which implied cover cropping or pasture.

"Green manure" was reported as a tillage practice by two growers, probably similar to cover cropping in function.

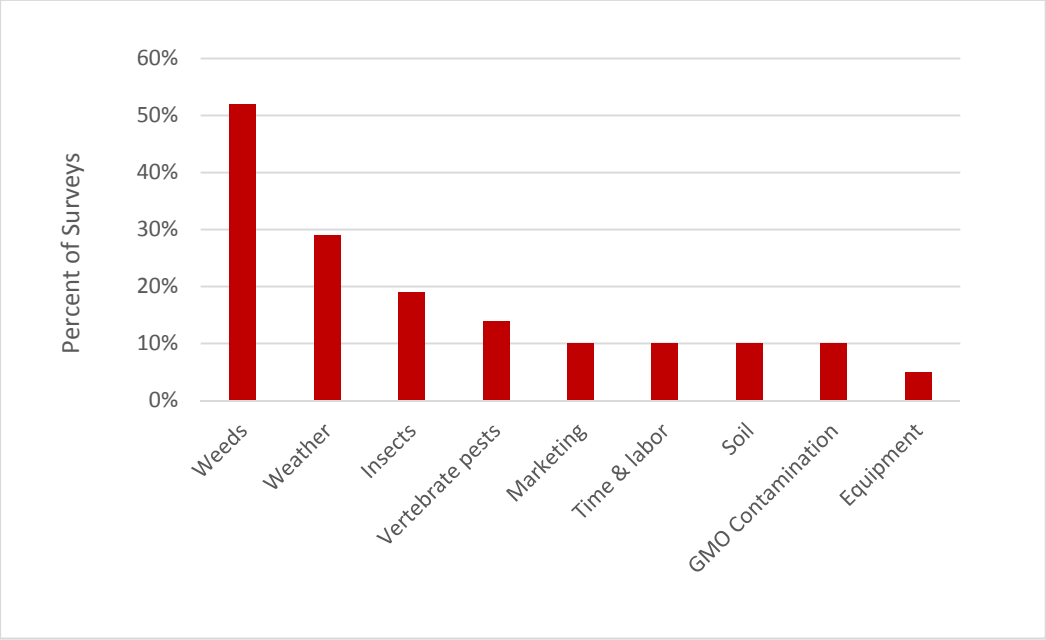
Question 7: What is the most challenging agronomic issue for your organic production

Weed management is clearly a key issue for organic growers, reported by over half of the survey respondents. This issue was followed in order by weather, insect pests, and vertebrate pests (Table 4).

Table 4. Challenging Agronomic Issues and the Number and Percentage of Surveys Reporting Each Issue

Challenging Agronomic Issue	Number and Percent of Surveys Reporting the Issue
Weeds	11 (52%)
Weather	6 (29%)
Insects	4 (19%)
Vertebrate Pests	3 (14%)
Time & Labor	2 (10%)
Marketing	2 (10%)
Soil	2 (10%)
GMO Contamination	2 (10%)
Equipment	1 (5%)

Figure 2. Agronomic challenges faced by growers and the percent of surveys reporting each agronomic challenge



Some surveys included the names of specific species of weeds that were consistent with those reported in response to Question 22 which is discussed below. Two growers reported issues with the effect of weed management procedures on soil quality.

Montana's weather can be challenging for row crops; some are sensitive to extreme weather including cold and frost. Three growers from Northwestern Montana reported cold weather and short growing season as issues. Three growers reported issues with extreme events such as dry spells, high winds, and hail.

Insect and vertebrate pest issues involved the access to organically acceptable management alternatives. Deer and rodents were named as vertebrate pests.

Small scale organic row crop production is usually labor intensive and, as one survey reported, affordable equipment for small scale operations is not readily available. One respondent put the issue simply, "…too much work not enough time."

Crops in Your Organic Operation

Question 8. What crops do you grow?

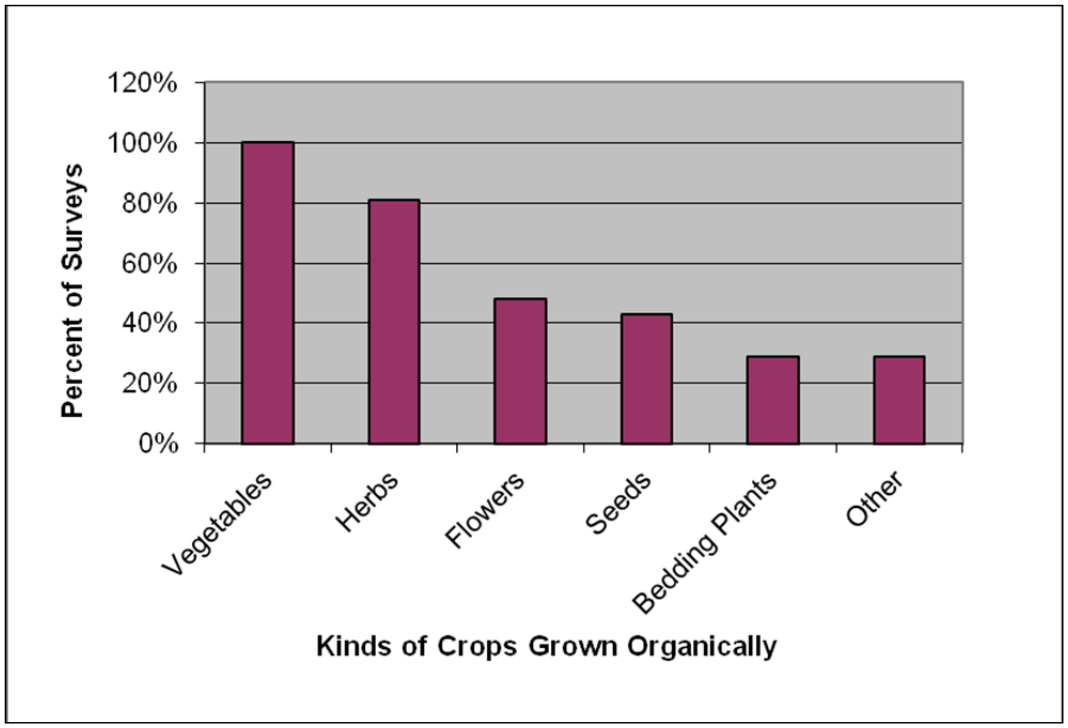
1. **Vegetables**
2. **Herbs**
3. **Bedding Plants**
4. **Seeds**
5. **Flowers**
6. **Other (describe)**

The results from this question show that most growers were engaged in more than one enterprise. All growers produced vegetables. Following are the numbers and percentages of surveys that checked each enterprise:

Vegetables	21 (100%)
Herbs	17 (81%)
Flowers	10 (48%)
Seeds	9 (43%)
Bedding Plants	6 (29%)
Other	6 (29%)

The "Other" category included fruit (2), livestock (2), and hay (2).

Figure 3. Kinds of organic crops and the percent of surveys reporting each kind of crop



Question 9: List up to 12 crops you have produced and rank each in terms of the success of production. Be specific as to crop name. (Rank: 1=Very Successful, 2=Moderate Success, 3=Unsuccessful)

Results from this question show the broad range of the types of crops being grown (Table 5). All crops except eggplant, flowers, and berries were reported as being grown very successfully or moderately successful. The degree of success to which row crops are grown in the region is due to a variety of factors including pest pressure, climate, seed availability, marketability, and others. It is beyond the scope of the survey to discuss the factors contributing to the degree of success. One might speculate that butterfly pests contribute to difficulties growing Brassica, and that climate could influence the success of cucumber, corn, and eggplant crops.

Table 5. Types of vegetables and herbs being grown and the degree of success reported by growers

Crop Type	Very Successful	Moderate Success	Un-Successful	Number of Surveys
Lettuce, greens & salad mix	12	2	0	**14**
Alliums (onions, leeks, garlic)	9	5	0	**14**
Tomatoes	8	6	0	**14**
Brassica (cabbage, broccoli, cauliflower, kale, others)	8	2	2	**12**
Carrots	6	5	0	**11**
Beets	8	1	0	**9**
Squash (winter & summer)	6	3	0	**9**
Peas	5	3	0	**8**
Peppers (sweet & hot)	6	2	0	**8**
Beans (snap, pole, dry, fava)	5	3	0	**8**
Herbs	6	1	0	**7**
Spinach	6	1	0	**7**
Cucumbers	5	0	1	**6**
Chard	4	0	0	**4**
Potatoes	3	2	0	**5**
Corn (sweet)	1	2	1	**4**
Eggplant	0	1	2	**3**
Rhubarb	1	0	0	**1**
Winter wheat	1	0	0	**1**
Flowers	0	1	0	**1**
Berries	0	0	1	**1**
Other	5	0	0	**5**

Question 10: Rank each of the following factors in terms of their influence on your yields. (Rank: 1=Major influence, 2=Moderate influence, 3=Minor influence, 4=No influence, N/A=Not applicable)

_____Weeds
_____Diseases
_____Soil Fertility/nutrient deficiencies
_____Pests
_____Varieties of seed
_____Rainfall
_____Others (Please Describe and Rank)

A summary of the results from this question are shown in Table 6. Weeds were clearly the top factor affecting yield. The difficulty in managing weeds organically probably contributes to their influence on yields. Weed management practices allowed by organic standards include crop rotations, cover crops, sanitation, cultivation, mowing, mulching, grazing, hand weeding, and others. Only when these practices are insufficient, may growers consider the few weed control substances that are allowed. Specific weeds and associated management difficulties are addressed in the results for Question 22.

Table 6. The degree of influence of factors on the yield of organic row crops

Yield Factor	Major Influence	Moderate Influence	Minor Influence	No Influence	N/A
Weeds	11	7	2	1	0
Varieties of Seed	6	9	5	1	0
Pests	5	9	7	0	0
Soil Fertility/Nutrient Deficiencies	5	9	5	2	0
Diseases	2	6	6	6	1
Rainfall	0	8	4	6	3
Other	3	3	0	0	0

Varieties of seed were the second most influential factor on crop yield which is probably due to the availability of seed (and planting stock) in organic form. A number of varieties are simply not available in organic form. Varieties of organic seed that are adapted to challenging growing conditions of the Montana region are limited.

Pests were the third most influential factor. The species of pests that are problematic are identified in the responses to Question 29. Growers must control pests by using methods allowed by organic standards which include crop rotation, sanitation, cultural practices, biological controls, development of habitat for natural enemies, and non-synthetic controls such as traps and repellents. There is certainly some difficulty and experience needed to implement these standards and to identify pest species and their life cycles.

Soil fertility and nutrient deficiencies were similar to pests in the degree of influence on yield. As discussed later, many growers are managing soil nutrients by incorporating green manure crops; adding materials such as livestock manure, compost, and manure; and applying approved substances based on results of soil testing.

While eight surveys reported that diseases were a major (2) or moderate (6) factor; over half of the surveys (13) reported that crop diseases were a minor influence on yield (6), no influence

(6), or not applicable (1). Specific kinds of diseases and their difficulty to manage are presented in the responses to Question 26. One might speculate that diseases in organic systems might become more evident with grower experience or over time due to issues related to rotations, sanitation, or others. However, no association was discernible between years of experience and the responses to Question 10. It may simply be that diseases are less of an issue in comparison with other factors.

Rainfall was not a major influence to any growers, but it was a moderate influence to eight growers. Most row crops are irrigated, making rainfall less of an issue. However it may become an issue where irrigation systems are limited such as down time for irrigation districts, where supplies are seasonal, or where limited by capacity.

The yield factor "Other" included damage from deer feeding and impacts from severe weather such as wind and hail.

Question 11: Describe the crops (vegetables, seeds, legumes, forages, green manures, etc.) that are in your rotation and their sequence.

Twenty surveys replied to this subject. Some rotations were described in detail; others simply. The responses were highly variable making it difficult to find commonalities among practices. Some of the practices are discussed below.

- The length of the rotation was described in 12 surveys and was as follows:
  2 years…..1 survey
  4 years…..5 surveys
  5 years…..4 surveys
  6 years…..2 surveys
- Eighteen rotations included green manure or cover crops, while two rotations did not include green manure or a cover crop. The two terms seemed to be used interchangeably in many instances. Five surveys specified that green manure or cover crops were seeded after harvest of individual crops or in the fall.
- While it was clear that crop types were rotated, 12 surveys did not clarify which crops were rotated together. However, eight growers clarified that related crop types were rotated together, for example, all alliums (onions, garlic, and leeks). Several growers said this was a disease management strategy. Two surveys described keeping heavy fertilizer feeders; i.e. corn, separate from light feeders in the rotation.
- Two rotations included alfalfa hay. One of these said that four to five years of vegetables followed four to five years of alfalfa. For the other, two years of vegetables followed an unspecified duration of alfalfa.
- Two rotations included livestock. For these growers, livestock added nutrients to the system and green manure/cover crops provided forage.
- One grower of perennial herbs rotated these at five year intervals.

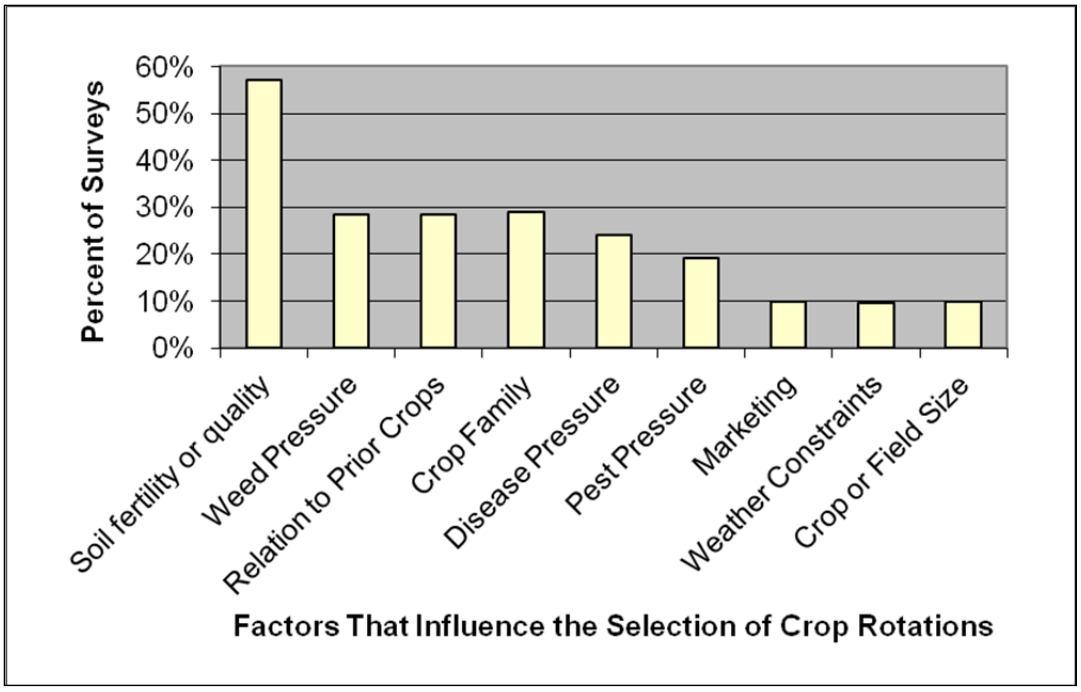
Question 12: What factors influence your selection of crop rotations?

The factors described by growers were consolidated into nine categories which are shown in Table 7 and Figure 4 with the number and percent of surveys reporting each factor.

Table 7. Factors that Influence the Selection of Crop Rotations

Factor	No. of Surveys	Percent of Surveys
Soil fertility or quality	12	57%
Weed Pressure	6	29%
Relation to Prior Crops	6	29%
Crop Family	6	29%
Disease Pressure	5	24%
Pest Pressure	4	19%
Marketing	2	10%
Weather Constraints	2	10%
Crop or Field Size	2	10%

Figure 4. Factors that influence the selection of crop rotations and the percent of surveys reporting each factor



Over half of the surveys reported that soil fertility or quality was a factor in planning rotations. Respondents commented that soil fertility test results influenced decisions to plant nitrogen fixing or nutrient scavenging crops. Two surveys reported that “heavy feeders” were rotated separately from “light feeders.”

Weed pressure was a factor reported by over one-fourth of the surveys. One grower said that high weed pressure in a current year's crop can influence decisions to plant weed suppressing row or cover crops. One grower reported that large-leaf plants were planted where weed competition was necessary. Several surveys indicated that weed suppression was a function of cover crops in their rotations.

While surveys were not always clear on how prior crops are considered, this was a factor also reported by over one-fourth of the surveys. One grower reported that crop quality and production were factors in planning a rotation for a following year. Another reported that the potential for a prior crop to deplete nutrients was a factor.

Growers reported that crop families, mustards for example, are commonly rotated together to break weed, pest, and disease cycles and to prevent pest build up.

Several surveys described how crops are rotated to address diseases or pests. For example, one grower said that potatoes were rotated to help reduce scab.

Other factors affecting rotations included wind, allelopathy, ease in tilling cover or green manure crops, space limitations, and timing of harvest.

Green Manure/Cover Crops in Your Organic Operation

Question 13: Have you grown a green manure crop as part of your rotation?

1. Yes **2. No**

Eighteen growers (86% of surveys) reported that their rotations included green manure while three (18%) did not have green manure in their rotations. The survey instructions stated that the term "green manure" included both "green manure" and "cover" crops.

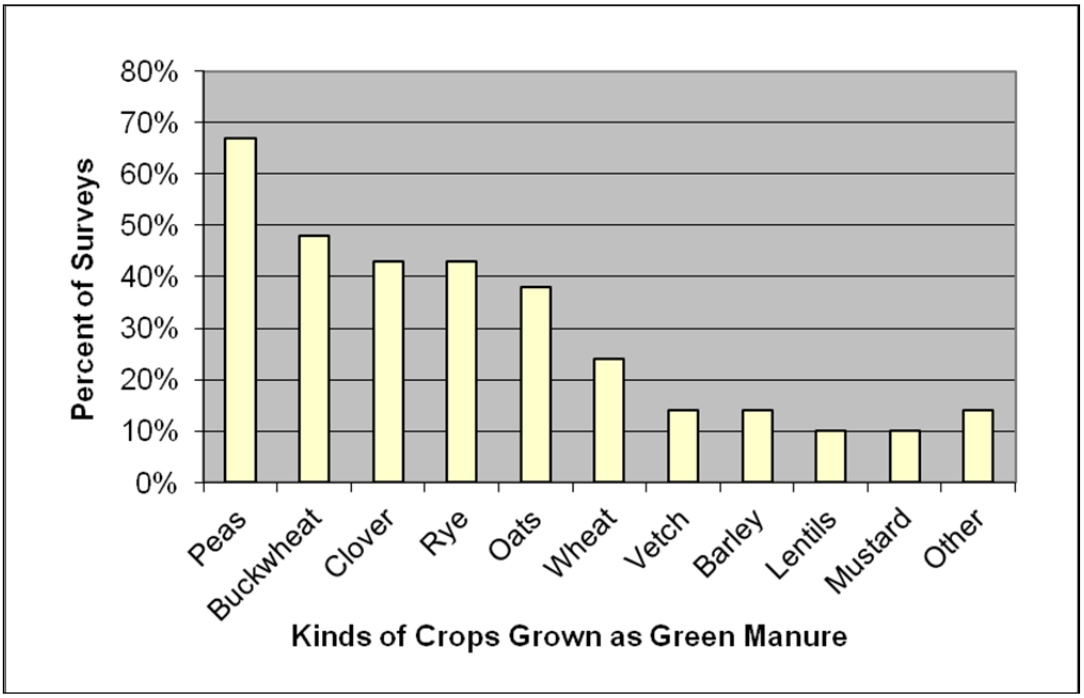
Question 14: Please list the crops grown as green manure?

Peas and clover, nitrogen-fixing plants, were the first and third most common green manure crops (see Table 8 and Figure 5). Some surveys specified Austrian Winter Peas, others field peas, and many simply "peas." Likewise, "clover," the third most common green manure crop, probably represented several clover types. Buckwheat, which has attributes that include sequestering phosphorus and attracting pollinators, was the second most commonly reported. Other green manure crop types included cereal grains such as oats, rye, wheat, and barley whose qualities include weed competition and soil building. "Other" crop types included canola, forage rape, Mexican marigold, sunflower, and turnips.

Table 8. Crop Types Grown as Green Manure in Organic Vegetable and Herb Systems and the Number and Percent of Surveys Reporting Each Type

Green Manure Crop Type	No. of Surveys	Percent of Surveys
Peas	14	67%
Buckwheat	10	48%
Clover	9	43%
Rye	9	43%
Oats	8	38%
Wheat	5	24%
Vetch	3	14%
Barley	3	14%
Lentils	2	10%
Mustard	2	10%
Other	3	14%

Figure 5. Kinds of crops grown for green manure by organic farmers and the percent of surveys that reported each kind of crop



Question 15: How much of your cropland is in green manure each year?

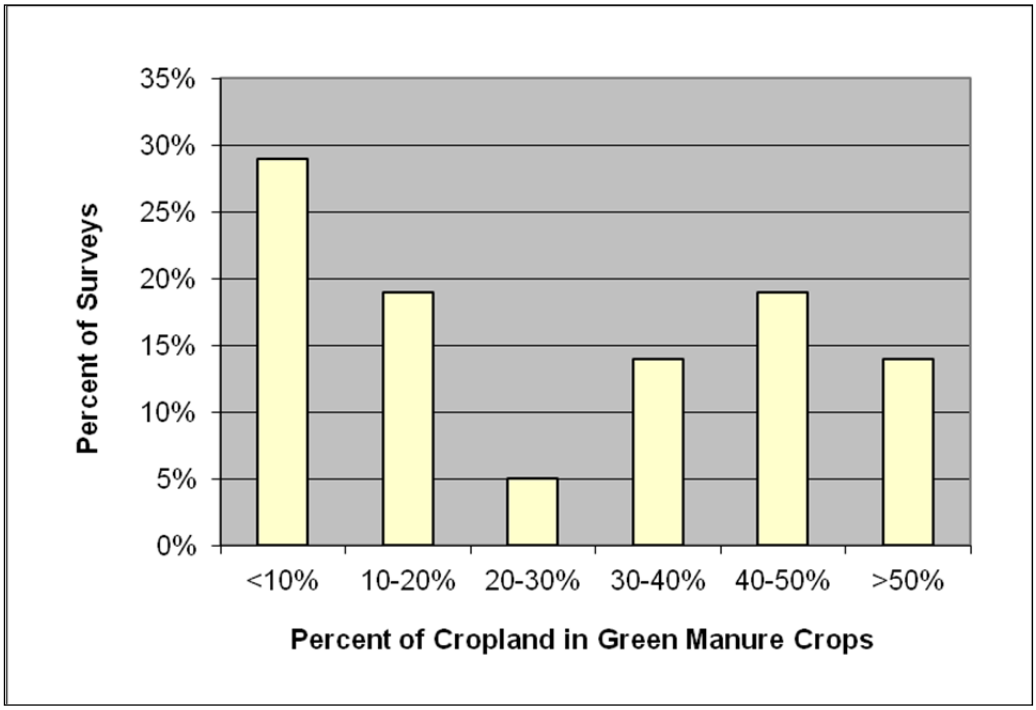
1. **<10%**
2. **10-20%**
3. **20-30%**
4. **30-40%**
5. **40-50%**
6. **>50%**

The amount of cropland planted yearly in green manure was quite variable (see Table 9 and Figure 6). The median percentage was 20-30%; however, the range was less than 10% to greater than 50%. Three growers reported that their rotations did not include green manure; these are included in the <10% category.

Table 9. Amount of cropland in green manure by percentage ranges and the number and percent of surveys in each range

Percent of Cropland in Green Manure Yearly	No. of Surveys	Percent of Surveys
<10%	6	29%
10-20%	4	19%
20-30%	1	5%
30-40%	3	14%
40-50%	4	19%
>50%	3	14%

Figure 6. Amount of land (in percent of total cropland) that is planted yearly in green manure crops and the percent of surveys reporting each percentage



Question 16: What are the greatest benefits of your green manure crops? (Rank: 1=Great Benefit, 2=Moderate Benefit, 3=Limited Benefit, 4=No Benefit, N/A=Not Applicable)

1. **Build soil fertility**
2. **Improve soil structure**
3. **Control Weeds**
4. **Break weed, disease, or insect pest cycles**
5. **Reduce soil erosion**
6. **Other (Describe and rank):**

Over three-fourths of the surveys assigned “great” or “moderate benefit” to the ability of green manure crops to build soil fertility and improve soil structure. About half of the surveys said that green manure crops were of “great” or “moderate” benefit in controlling weeds; breaking weed, disease, and insect pest cycles; and reducing soil erosion (see Table 10). Two growers reported that green manure crops had no benefit in breaking weed, disease, and insect pest cycles or in reducing soil erosion. Most growers assigned “moderate benefit” to the ability of green manure crops to reduce soil erosion (also a function of “cover crops”). Benefits reported as “other” included the capture of soil nutrients and provision of livestock forage.

Table 10. Benefits of green manure crops, the degree of benefit, and the number of survey responses for each benefit and degree of benefit

Green Manure Benefits	Great Benefit	Moderate Benefit	Limited Benefit	No Benefit	Surveys Reporting
Build soil fertility	13	3	2	0	18
Improve soil structure	14	3	1	0	18
Control weeds	10	3	3	0	16
Break weed, disease, insect pest cycles	9	3	1	2	15
Reduce soil erosion	3	8	2	2	15
Other	1	1	0	0	2

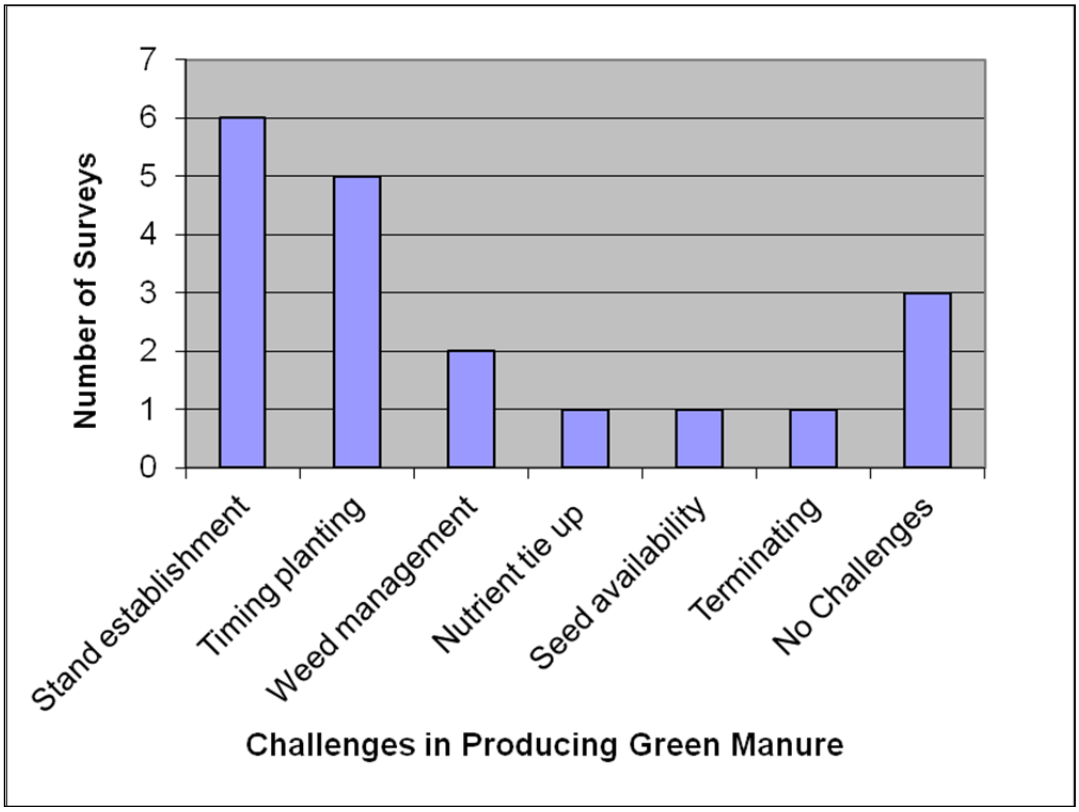
Question 17: What are your biggest challenges with your green manure production?

"Establishing a stand" was the most commonly reported challenge (see Table 11 and Figure 7). In some instances this challenge was related to the practice of seeding in the late summer or fall. As one grower said, "Establishing a green manure after vegetable row crops are in, before temperatures drop too low." One grower reported problems with sufficient spring growth; this may also be related to the practice of fall planting where the field of green manure is terminated in the spring prior to planting the field to a vegetable crop. One survey reported that stand establishment was not efficient with a drip irrigation system, and another survey reported low germination with a broadcast seeding method.

Table 11. Challenges with Green Manure Production and the Number and Percent of Surveys Reporting Each Challenge

Green Manure Challenges	No. of Surveys	Percent of Surveys
Stand establishment	6	29%
Time of planting	5	24%
Weed management	2	10%
Nutrient tie up	1	5%
Seed availability	1	5%
Terminating	1	5%
No Challenges	3	14%

Figure 7. Challenges faced by organic farmers in producing green manure and the number of surveys reporting each kind of challenge



"Time of planting" was related to the practice of seeding green manure in the fall during a busy, short window of opportunity. As a grower stated, "Finding time in late summer/fall to drill it." One survey reported that "often the water is off 2 wks. after seeding." The water years for supplied water systems commonly end early in the fall.

"Weed management" within the green manure crop was the biggest challenge for two growers.

"Nutrient tie up" by decomposing residue was a concern to one grower who terminated green manure in the spring prior to planting the field to vegetables.

"Seed availability" was described as a problem finding preferred varieties.

"Terminating" without tillage was described as a challenge by a grower practicing no-till farming. Another grower reported that terminating rye had been a problem, but was no longer since rye had been removed from the rotation.

Three surveys reported no challenges with green manure production.

Question 18: Was terminating the green manure an issue?/How do you terminate green manure crops?

Terminating (killing) green manure crops can be an issue, particularly when perennial or biennial plants such as winter rye or clover are in the green manure. However, this was not an issue for most organic vegetable and herb growers. Thirteen surveys reported "no issues" with terminating green manure crops, while two surveys reported "yes."

The methods for terminating green manure were summarized in four major categories as shown in Table 12. Some growers used a combination of methods, for example, mowing and/or grazing often preceded cultivation. Cultivation as a termination method involved a variety of tools to till or incorporate the crop that included chisel plows, discs, rototillers, and spaders. Mold board type plows were notably absent.

Mowing, in addition to functioning to terminate green manure may have benefits in preventing seed set and in assisting with cultivation.

Of the growers reporting "yes" (problems with terminating green manure), one reported that terminating was no longer a problem after beginning to use a flail mower. The other grower reported problems with terminating green manure that established in perennial berry crops.

Table 12. Methods for Terminating Green Manure Crops and the Number and Percent of Surveys Reporting Each Method

Methods for Terminating Green Manure Crops	No. of Surveys	Percent of Surveys
Cultivation	14	67%
Mowing	8	38%
Grazing	3	14%
Winter kill	2	10%

Question 19: Do you think green manure compromises soil moisture and nutrient availability?

Of the eighteen surveys that answered this question, seventeen answered "no," that green manure did not compromise soil moisture and nutrient availability. One survey answered "yes," that green manure compromised nutrients. One grower stated, "No (green manure) adds nutrients, retains nutrients, pulls-up nutrients & increases OM (organic matter) which holds more moisture."

Several surveys explained the presence of irrigation made soil moisture less of an issue. Supplied irrigation is a feature of most vegetable and herb operations.

Some growers explained that timely termination of green manure was necessary to allow for breakdown and release of tied-up nutrients before planting the next crop.

One survey reported that nutrients were compromised because clover intercropped with garlic competed with the garlic for nutrients.

Question 20: Would you consider incorporating livestock to manage green manure/cover crops?

1. **Yes**
2. **No**
3. **Maybe**
4. **Already use livestock for this purpose**
5. **Other (Please Explain)**

The responses to this question were as follows:

Yes 6
No 5
Maybe..... 2
Already use livestock for this purpose 6
Other 0

One grower was concerned about food safety issues with livestock manure.

Weeds in Your Organic Operation

Question 21: List the crops on your farm that are adversely influenced by weeds and rank each crop in terms of the degree of influence. (Rank: 1=Major influence, 2=Moderate influence, 3=Minor influence, 4=No influence, N/A=Not Applicable)

Fifteen surveys listed information about the influence of weeds on specific crops. This information is summarized in Table 13. For reporting purposes, some crop groups were combined including alliums, leafy greens and lettuce, and mustard family.

Table 13. The Influence of Weeds on Crop Species and Groups and the Number of Surveys Reporting for Each Species and Group

Crop Species and Groups	Major Influence	Moderate Influence	Minor Influence	No Influence	No. of Surveys
Alliums[1]	7	5	0	0	12
Carrots & parsnips	7	3	0	0	10
Lettuce & greens	2	4	2	0	8
Squash, summer & winter	2	2	2	0	6
Tomatoes	2	1	3	0	6
Potatoes	2	2	1	0	5
Herbs, annual & perennial	2	2	0	0	4
Peppers & Chilies	2	1	1	0	4
Asparagus	2	0	0	0	2
Berries	2	0	0	0	2
Corn, sweet	1	3	0	0	4
Beets	1	3	0	0	4
Brassica[2]	1	2	1	0	4
Cucumbers	1	1	1	0	3
Peas	0	3	0	0	3
Beans, snap	0	2	0	0	2
Chard	0	1	0	0	1
Other	4	2	1	0	7

[1] garlic, leeks, onions

[2] broccoli, cabbage, cauliflower, kale

All listed crops were reported as receiving a degree of influence from weeds; none were reported as receiving “no influence.” For most crops, the totals for “major” plus “moderate” weed influence exceeded the totals for “minor” plus “no” influence.

Alliums, carrots, and parsnips were adversely influenced in a major way by weeds. These crops are known to be poor competitors with weeds.

Lettuce and greens, squash, tomatoes, and potatoes were named as influenced in a major way, but they were also reported on other surveys as receiving minor influence from weeds. Rapid growth and good leaf cover make some of these crops stronger competitors with weeds.

Perennial crops such as asparagus, berries (strawberries and raspberries), and some perennials were reported as receiving major to moderate influence from weeds.

Crops reported in "Other" included eggplant, irises, roses, shrubs, trees, seedlings, seed crops, buckwheat, and cover crops.

Four surveys did not provide information for specific crops, but they indicated that weeds did not adversely influence crops. Of these responses, two wrote "none" in response to the question and two stated that their weed management was sufficient to mitigate adverse influences on the crop.

Question 22: List up to 10 weed species on your farm and rank how hard they are to manage. (1=Easy, 2=Difficult but Manageable, 3=Hard, 4=Impossible)

A total of 28 annual, biennial, and perennial weed species were reported on the surveys. Two surveys stated that no weed issues were present. Table 14 shows weed species, the total number of surveys reporting each species, the total number of surveys for each management difficulty ranking, and an average difficulty ranking for each species. Some related species such as knapweeds were combined.

Perennial weeds were generally rated as harder to manage than annual weeds. The perennial weeds, Canada thistle, field bindweed, and quackgrass were the most commonly reported. Of these, field bindweed was the most difficult to manage, rated as hard or impossible, followed in order of difficulty by quackgrass and Canada thistle.

Annual grasses, mallow, and chickweed had the highest average management difficulty of the annual species. However, pigweed and mallow were the most frequently reported annual weeds and, of these, mallow was the more difficult to control

Table 14. Weed Species Ranked as to Management Difficulty by Organic Vegetable and Herb Growers and the Number of Surveys Reporting Each Species

Weed Species	1 Easy	2 Difficult	3 Hard	4 Impossible	Average	No. of Surveys
Perennial & Biennial						
Field Bindweed	0	0	5	5	**3.50**	**10**
Houndstongue	0	0	1	1	**3.50**	**2**
Quackgrass	1	1	4	3	**3.25**	**9**
Smooth Brome	0	0	2	0	**3.00**	**2**
Canada Thistle	1	5	6	4	**2.81**	**16**
Knapweed Species	1	1	1	1	**2.50**	**4**
Dandelion	0	3	0	0	**2.00**	**3**
White top	0	1	0	0	**2.00**	**1**
Other	0	3	0	0	**2.00**	**3**
Annual Weeds						
Annual Grasses[1]	0	1	3	0	**2.75**	**4**
Mallow	0	4	6	0	**2.60**	**10**
Chickweed	0	2	2	0	**2.50**	**4**
Purslane	0	2	1	0	**2.33**	**3**
Kochia	0	2	1	0	**2.33**	**3**
Plantain	0	2	1	0	**2.33**	**3**
Pigweed	0	9	2	0	**2.20**	**11**
Lamb's Quarters	2	3	1	0	**2.00**	**6**
Prickly/Wild Lettuce	1	1	1	0	**2.00**	**3**
Brassicas	1	4	0	0	**1.80**	**5**
Sunflower	1	0	0	0	**1.00**	**1**
Other	0	0	2	0	**3.00**	**2**

[1]Cheatgrass, pigeon grass, wild oats

Question 23: Would you consider incorporating livestock to manage weeds?

1. **Yes**
2. **No**
3. **Maybe**
4. **Already use livestock for this purpose**
5. **Other (Please Explain):**

The responses to this question (shown below) are similar to the responses to question 20.

Yes 6
No 7
Maybe..... 2
Already use livestock for this purpose 6
Other 0

Question 24: What weed research do you feel is most needed? (Please Explain)

Sixteen surveys included suggestions for weed research, and three had no suggestions. Another two surveys indicated that weeds were not an issue, and research was not needed. Research suggestions are shown below with the number of responses received for each research topic in parentheses.

1. Organic methods for controlling bindweed including biological, cultural, livestock, and crop rotations (3),
2. Adjusting cultivation practices such as timing and depth to help control weeds (3),
3. How can crop rotations help to control weeds? What specific cover crop species are effective at weed control? (2),
4. Use of livestock for weed control (2),
5. Organic methods for controlling Canada thistle (1), and using lysine to control Canada thistle (1),
6. Using mulch or other barriers to prevent weed establishment or weed seed invasion (2),
7. The economics, labor savings, and environmental costs of plasticulture (synthetic mulches, tunnels, etc.) (1),
8. Variety trials to determine adaptability to Montana and its microclimates and ability to compete with weeds (1),
9. Can weed species be an indicator of soil health? (1),
10. Quack grass control (1),
11. Common mallow control (1),
12. Chickweed control (1),
13. Using vinegar to control weeds such as knapweed (1),
14. Can weeds be a green manure crop and a source of soil organic matter? (1),
15. Crop polyculture (intermixing multiple crop species) (1),
16. Costs of labor for weed control (1),
17. Solar powered robot weeders (1).

Diseases in Your Organic Operation:

Question 25: List the crops on your farm that are adversely influenced by diseases, and rank each crop in terms of the degree of influence. (Rank: 1=Major influence, 2=Moderate influence, 3=Minor influence, 4=No influence, N/A=Not Applicable)

Fifteen surveys had responses to this question. Of these surveys, two did not list crops and stated that diseases had not been a problem. Thirteen surveys listed one or more crops and ranked the degree of influence on each crop.

Clear trends were not evident in the responses to this question. The responses tended to be limited and diverse. Potatoes, tomatoes, and alliums were most frequently reported (4 surveys each) as susceptible to major or moderate influence from diseases. Diseases of potatoes reported in Question 26 included scab, late blight, early blight, fusarium, and rhizoctonia. Diseases of tomatoes included sclerotinia, late blight, early blight, fusarium, and blossom end rot. Diseases of alliums reported in Question 26 included white rot, aster yellows, downy mildew, and fusarium.

Table 15. Crops That Are Adversely Influenced by Diseases, the Degree of Influence and the Number of Surveys Reporting for Each Species

Crop Species and Groups	Major Influence	Moderate Influence	Minor Influence	No Influence	No. of Surveys
Tomatoes	2	2	1	1	6
Potatoes	2	2	1	0	5
Alliums[1]	1	3	1	0	5
Squash[2]	1	1	1	1	4
Lettuce & greens	1	1	0	1	3
Beans, snap	0	2	0	0	2
Cucumbers	0	2	0	0	2
Hops	0	1	0	0	1
Basil	0	1	0	0	1
Cilantro	0	1	0	0	1
Corn, sweet	0	1	0	0	1
Carrots	0	0	1	0	1
Peas	0	0	1	0	1
Beets	0	0	1	0	1
Peppers & Chilis	0	0	0	1	1
Other	2	0	0	0	2

[1]garlic, leeks, onions

[2]summer & winter

Question 26: List up to 5 diseases on your farm and how hard they are to manage.

(1=Easy, 2=Difficult but Manageable, 3=Hard, 4=Impossible).

Fifteen surveys had responses to this question. Of these, four surveys did not name diseases and indicated that diseases were not a problem. Eleven surveys named and ranked one or more diseases. Six surveys provided no information for the question.

Growers identified 17 crop diseases, and most were ranked as difficult, hard, or impossible to manage. More information is needed to match specific diseases and crops.

Table 16. Crop Diseases Ranked as to Management Difficulty by Organic Vegetable and Herb Growers and the Number of Surveys Reporting Each Disease

	Degree of Difficulty				
Disease Name	Easy	Difficult but Manageable	Hard	Impossible	No. of Surveys
Powdery mildew	1	2	1	0	4
Scab	0	1	1	1	3
Sclerotinia & white mold	0	1	0	1	2
Late Blight	0	1	1	0	2
Early blight	0	1	1	0	2
White Rot	0	1	1	0	2
Aster Yellows	0	0	0	1	1
Bean Halo Blight	0	0	1	0	1
Black Rot	0	0	1	0	1
Downy Mildew	0	0	1	0	1
Fusarium	0	0	1	0	1
Rhizoctonia	0	0	1	0	1
Bacterial Blight	0	1	0	0	1
Blossom End Rot	0	1	0	0	1
Botrytis	0	1	0	0	1
Damping Off	0	1	0	0	1
Nematodes	0	1	0	0	1

Question 27: What diseases research do you feel is most needed?

Fifteen surveys had responses to this question. Of these, five surveys indicated that diseases were not a problem or that research was not necessary. As one grower stated, “I feel our disease issues are managed effectively with drip irrigation and rotation.” Ten surveys suggested one or more research topics. Six surveys provided no information for the question.

Suggestions for crop disease research are summarized below with the number of surveys for each suggestion in parentheses.

1. What rotations and cover crops are effective in controlling diseases (2),
2. Organic methods for controlling diseases in greenhouses especially those of nightshades and cucurbits (1),
3. The spread of the range of diseases caused by climate change (1),
4. Organic control of scab of potatoes and beets (1),

5. Organic methods to control powdery mildew (1),
6. Variety culture for disease management (1),
7. Organic methods to control blights (1),
8. Disease research that is applicable to Montana's unique growing conditions (1),
9. Organic control of diseases vectored by insects (1),
10. Organic control of seed-borne diseases (1),
11. Managing calcium for blossom end rot of tomatoes (1),
12. Non-chemical methods to control a disease in soil (1).

Pests in Your Organic Operation

Question 28: List the crops on your farm that are adversely influenced by insects, and rank each crop in terms of the degree of influence. (Rank: 1=Major Influence, 2=Moderate Influence, 3=Minor Influence, 4=No Influence, N/A=Not Applicable)

Eighteen surveys listed one or more crops and defined the degree of influence by insects. Two surveys provided no information for the question. One survey stated that "not much insect damage" occurred.

Cultivated species of the genus *Brassica* were the most adversely affected by insects. This correlated well with results for Question 29 where the two most reported pests were pests of Brassicas, flea beetles and imported cabbageworms. The most widely grown crops in Montana in this genus probably are cabbage, cauliflower, broccoli, kohlrabi, and kale; however, other species such as collards and other leafy mustards are possible. Most surveys reporting this group tended to identify it broadly as Brassica(s), cole crops, mustards, or cabbage family. Separating survey results by species for this genus was not possible.

Potatoes were the second most commonly reported crop which may be due, at least partly, to damage from the Colorado potato beetle.

Lettuce and greens were reported as subject to moderate or minor pest influence on three surveys. These crops are susceptible to aphids which were the third most reported pest in Question 29.

Table 17. Organic Crops That Are Adversely Influenced by Insects, the Degree of Influence and the Number of Surveys Reporting for Each Crop

Crop Species or Group	Major Influence	Moderate Influence	Minor Influence	No Influence	No. of Surveys
Brassica[1]	7	4	2	0	13
Potatoes	2	3	1	1	7
Lettuce & Greens	0	2	1	2	5
Herbs	1	3	0	0	4
Chard	0	3	1	0	4
Tomatoes	0	1	1	2	4
Arugula	2	1	0	0	3
Eggplant	2	0	0	0	2
Spinach	0	2	0	0	2
Corn, sweet	0	1	1	0	2
Peas	0	1	1	0	2
Cucumbers	0	1	1	0	2
Alliums[2]	0	1	0	1	2
Squash[3]	0	1	0	1	2
Peppers & Chilies	0	0	0	2	2
Flowers	1	0	0	0	1
Bedding Plants	0	1	0	0	1
Beets	0	1	0	0	1
Carrots	0	1	0	0	1
Berries	0	0	1	0	1
Melons	0	0	1	0	1

[1]cabbage, broccoli, kale, others

[2]garlic, leeks, onions

[3]summer, winter

Question 29: List up to top 5 insects you see, and how hard they are to manage.

(1=Easy, 2=Difficult but Manageable, 3=Hard, 4=Impossible)

Flea beetles were the most commonly reported pest, and the management difficulty for this pest ranged from easy to impossible. A number of flea beetle species are pests of vegetables and herbs; some are general feeders and some are host plant specific. Several species are serious pests of Brassica crops which surveys identified as the crop group most influenced by pests.

Aphids, the second most commonly reported pest, ranged in management difficulty from easy to hard, but not impossible. A number of aphid species feed on vegetables and herbs; hardly any crops are immune.

More information is needed to identify pest species and the crops being harmed by specific species.

Table 18. Crop Pests Ranked as to Management Difficulty by Organic Growers and the Number of Surveys Reporting Each Pest

	1	2	3	4	
Pest Name	**Easy**	**Difficult, Manageable**	**Hard**	**Impossible**	**No. of Surveys**
Flea Beetles	2	4	4	3	13
Aphids	1	4	3	0	8
Imported Cabbageworm	0	1	5	0	6
Grasshoppers	1	1	3	1	6
Spider Mites	0	3	2	0	5
Cabbage Looper	1	1	2	0	4
Colorado Potato Beetle	1	3	0	0	4
Root Maggots	0	1	2	0	3
Slugs	0	2	0	0	2
Garden Symphylan	0	0	0	1	1
Wireworms	0	0	0	1	1
Corn Earworm	0	0	1	0	1
Cutworms	0	0	1	0	1
Leafminers	0	0	1	0	1
Ants	0	1	0	0	1
Thrips	0	1	0	0	1
Whiteflies	0	1	0	0	1
Nematodes	1	0	0	0	1
Other	1	0	0	0	1

Question 30: What pest research do you feel is most needed?

Thirteen surveys included suggestions for pest research, and six had no suggestions. Another two surveys indicated that pests were not an issue and that research was not needed.

Twenty research suggestions were received, and these are shown below with the number of responses received for each research topic in parentheses. Over half (13) of the suggestions were for research on specific pests.

1. Organic control of flea beetles (3),
2. Organic control of onion maggots and other root maggots (2),
3. Organic control of spider mites (2),
4. Organic control of vertebrate pests like deer and raccoons and economic assistance with deer fencing (2),
5. Comparative analyses of the efficacy of organic methods for controlling pests (1),

6. Organic control of aphids,
7. Organic control of the imported cabbageworm (1),
8. Organic control of cabbage loopers (1),
9. Relationships between soil health and pest pressure (1),
10. Development of diseases for biological control of pests (1),
11. Companion planting for pest management (1),
12. Methods for pest life-cycle disruption (1),
13. Plant-derived pesticides that are farmer-grown and prepared (1),
14. Organic mosquito control (1),
15. Alternatives to row covers (1).

Soil Nutrition in Your Organic Operation

Question 31. Do you do soil fertility and foliar testing?

1. **Yes, both**
2. **No, just soil**
3. **No, just foliar**
4. **No testing done**

Each of the 21 surveys included a response to this question as summarized below.

Both soil and foliar testing ..... 2 surveys (10%)
Just soil testing ..... 14 surveys (67%)
Just foliar testing ..... 0 surveys (0%)
No testing done ..... 5 surveys (24%)

Question 32: How frequently do you do soil testing?

1. **Every year**
2. **Every 2 years**
3. **3-4 years**
4. **4-5 years**
5. **>5 years**

Sixteen growers reported doing soil fertility testing (see Question 31) and all described their testing frequency. These responses are summarized in Table 19. Half of the growers that conducted soil sampling did so at intervals of one to two years.

Table 19. Frequency of soil testing and the number and percent of surveys at each level of frequency

Testing Frequency	Number and Percent of Surveys That Reported Soil Testing
Every Year	6 (38%)
Every 2 Years	2 (13%)
Every 3 - 4 Years	5 (31%)
Every 4 - 5 Years	0 (0%)
Greater Than 5 Years	3 (19%)

Question 33: How frequently do you do foliar testing?

1. **Twice a year**
2. **Every year**
3. **Every 2 years**
4. **3-4 years**
5. **4-5 years**
6. **5 years**

Two of twenty-one surveys reported that foliar sampling was conducted for fertility management. For these two surveys, the frequency of testing was two time per year for one and greater than five year intervals for the other.

Question 34: At what density do you do soil testing?

1. **Every Field**
2. **Most Fields**
3. **Few Fields**
4. **Other (Please Explain)**

Fifteen surveys responded to Question 34, and six surveys did not respond. The number of surveys reporting at each level and the percent of surveys reporting sampling density are shown in Table 20. Eighty percent of the growers replying to this question sampled every field or most fields. Growers reporting "Other" did not sample soil (2 surveys) and in one instance sampled soil in greenhouses only.

Table 20. Density of soil testing samples and the number and percent of surveys at each level of density

Soil Testing Density	Number and Percent of Surveys Reporting
Every Field	7 (47%)
Most Fields	5 (33%)
Few Fields	0 (0%)
Other	3 (20%)

Question 35: At what density do you do foliar testing?

1. **Every Field**
2. **Most Fields**
3. **Few Field**
4. **Other (Please Explain):**

Two growers did foliar testing (see Question 31), and both reported that testing density was every field.

Question 36: Do you believe you have nutrient deficiencies in your soil? (Circle One)

1. **Yes**
2. **No**
3. **Don't Know**

Nineteen surveys contained responses to this question which were as follows:

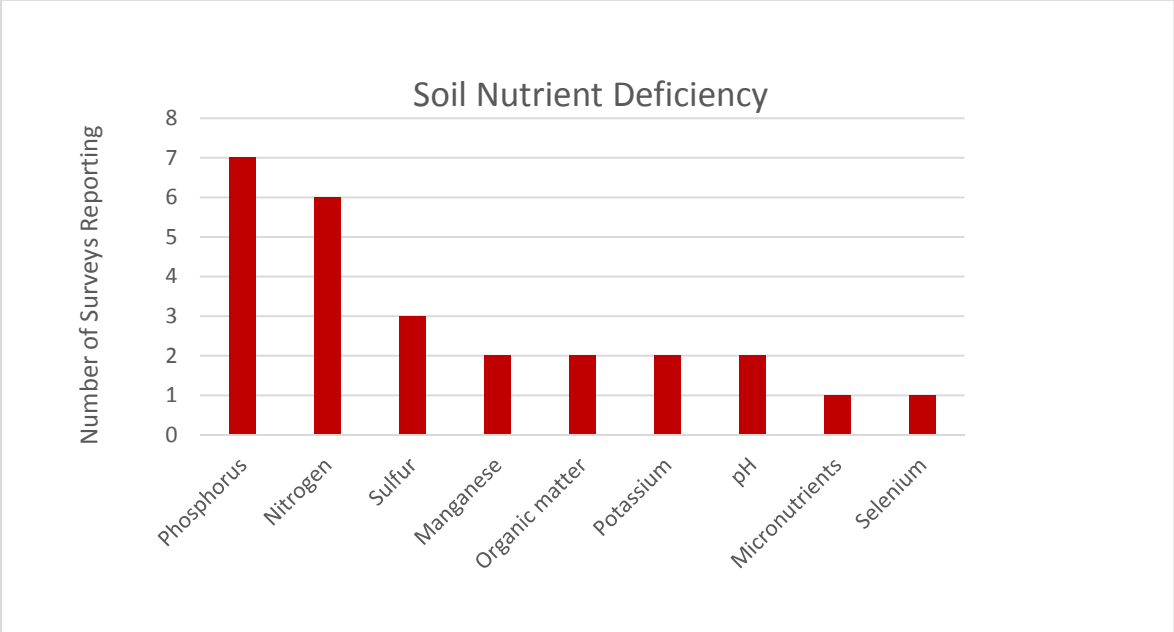
Yes 9 (43%)
No 6 (29%)
Don't Know 4 (19%)
No Response 2 (10%)

A comparison with results from Question 31 showed that a greater percentage of growers who conducted fertility testing reported nutrient deficiencies compared to those who did not test. Conversely, a higher percentage of growers who did not test reported no nutrient deficiencies compared with those who tested.

Question 37: If you know, list the top 5 nutrient deficiencies affecting your organic crops.

Twelve surveys responsed to this question. The major nutrients, phosphorus and nitrogen, were the most highly reported deficiencies (Figure 1).

Figure 8. Soil nutrient deficiencies reported on a survey of organic vegetable, herb, and row crop growers and the number of surveys reporting each deficiency



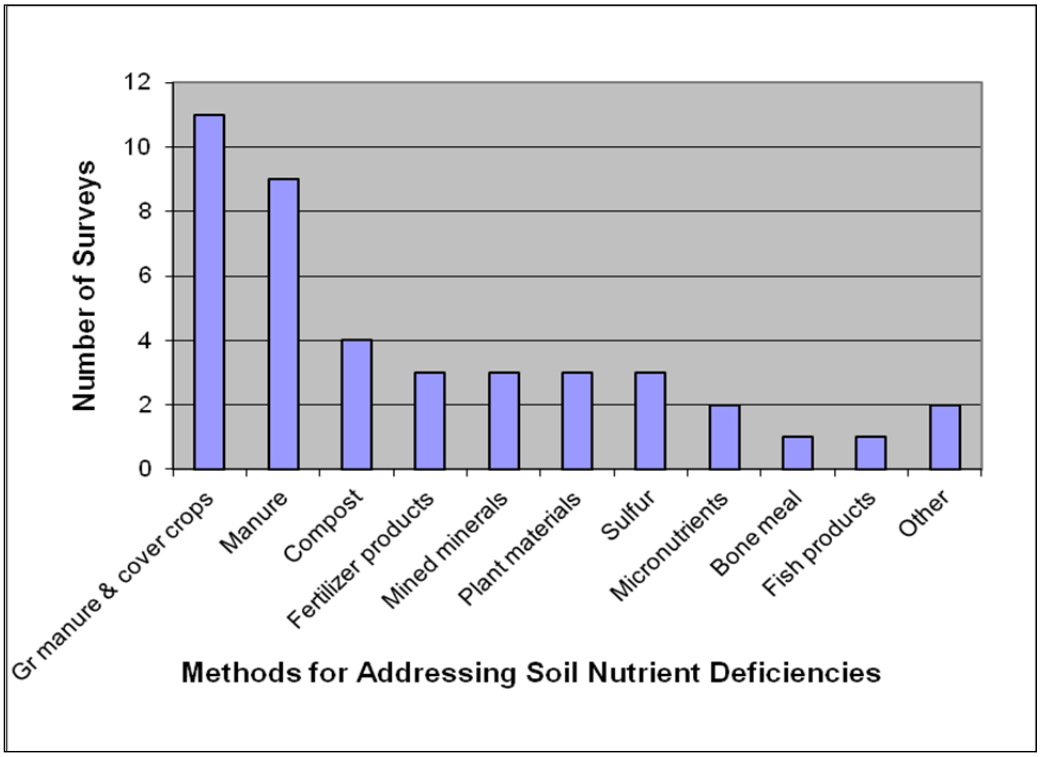
Question 38: How do you address the deficiencies in your soils?

Nineteen respondents replied to Question 38. Results were consolidated into 10 categories of methods and materials that growers use to address soil deficiencies (see Table 21 and Figure 9). Most growers use more than one method. Green manure and cover crops were grown by over half of the respondents. Three surveys stated that this practice added organic matter and fixed nitrogen.

Table 21. Methods and materials used by organic growers to address soil nutrient deficiencies and the number and percent of total surveys reporting each method or material

Method for Addressing Nutrient Deficiencies	Number of Surveys	Percent of Surveys
Green manure and cover crops	11	52%
Livestock and poultry manure	9	43%
Compost	4	19%
Fertilizer products	3	14%
Mined minerals	3	14%
Plant materials	3	14%
Sulfur	3	14%
Micronutrients	2	10%
Bone meal	1	5%
Fish products	1	5%
Other	2	10%

Figure 9. Methods used by organic producers to correct soil nutrient deficiencies and the number of surveys reporting each method



Addition of animal manure was the second most reported practice. A few surveys stated that the manure was "aged" or applied as a result of grazing. One survey said the manure was composted, and this result was therefore included in the "compost" category.

Some surveys merely identified "fertilizers," so these responses were included in the category "Fertilizer products." This category may include commercial formulations of organically accepted ingredients.

The mined minerals that were identified on the surveys included rock phosphate, gypsum, and azomite. Plant materials included alfalfa and mulches. Three growers reported using sulfur, and one of these clarified that it was used to correct high pH. "Fish products" are generally liquid emulsions or dry granules prepared from by-products of fish processing.

Question 39: What factors determine whether you add approved fertilizers or not?

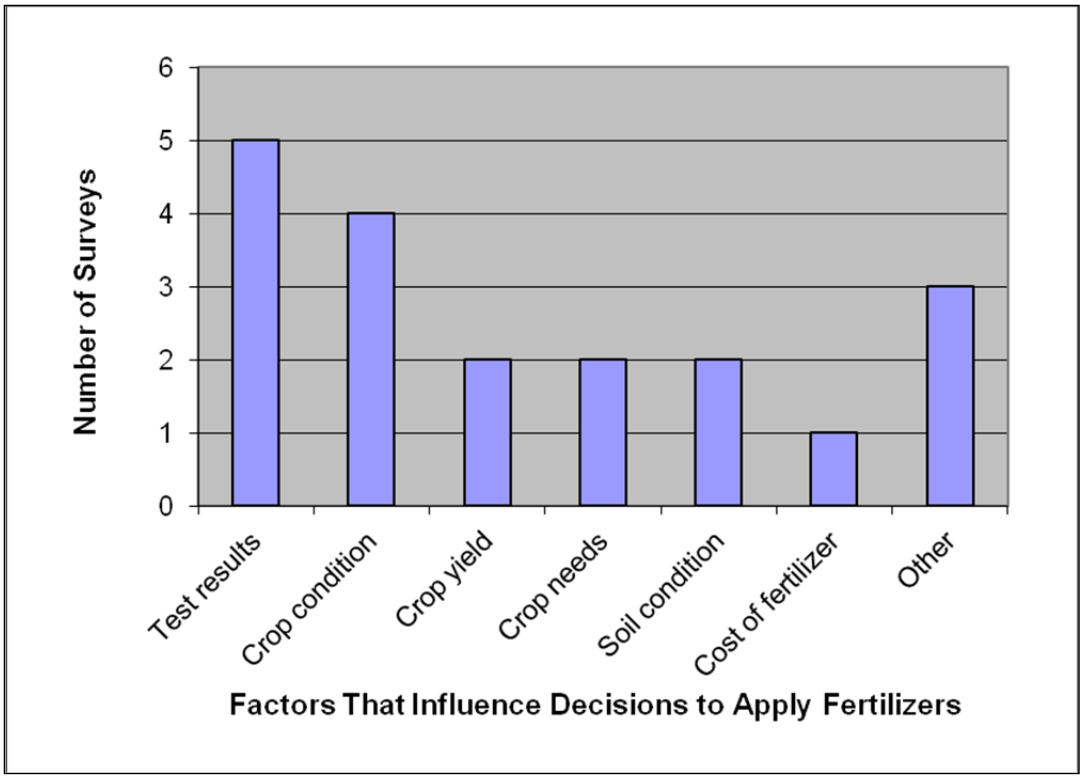
Fifteen surveys had responses to Question 39, and six surveys had no response. A total of 19 factors were described in the responses, and these were summarized in seven general categories as shown in Table 21 and Figure 10. Soil or foliar test results and visual observations of crop condition were the two most common factors that growers use to help decide whether to add fertilizers. Two growers reported that crop yield records were a factor in fertilizer use decisions. Knowledge of the needs of specific crops such as high nitrogen needs of corn was a factor reported by two growers. Soil condition or structure were factors reported by two growers, one of whom said that sandy soil required nitrogen-building. The "Other" category

included general farming “experience” that aided in fertilizer additions (2 surveys) and one survey reporting that fertilizers were not used.

Table 21. Factors that determine whether to add fertilizer and the number and percent of total surveys reporting each factor

Factors That Determine Whether to Fertilize	Number of Surveys	Percent of Surveys
Soil or foliar test results	5	24%
Observation of crop condition	4	19%
Crop yield	2	10%
Knowledge of crop needs	2	10%
Soil condition	2	10%
Cost of fertilizer	1	5%
Other	3	14%

Figure 10. Factors considered by organic farmers to determine whether to apply approved fertilizers and the number of surveys reporting each factor



Question 40: What soil fertility research do you feel is needed most?

Eight surveys included suggestions for soil fertility research, and 13 surveys had no suggestions. Research suggestions are shown below with the number of responses received for each in parentheses.

1. Using green manure and cover crops to manage soil fertility, and the benefits of various species of green manure and cover crops (2 surveys),
2. How is nutrient availability affected by factors such as temperature, moisture, time, and soil biota? (2 surveys),
3. Soil testing method that can be conducted by growers and that is inexpensive (1 survey),
4. Livestock and vegetable polyculture (1 survey),
5. The relationship between soil fertility and the nutritional qualities of crops (1 survey),
6. Understanding the nutrient needs of organic production (1 survey).

Marketing Issues in Your Organic Operation

Question 41: List the crops that face the biggest challenge to market. (Rank: 1=Easy, 2=Difficult but Manageable, 3=Hard, 4=Impossible, N/A=Not Applicable)

Table 22 shows the crops that organic growers reported along with their rankings of the difficulty in marketing the crops. The rankings for each crop were averaged to give a comparison between crops. Lower averages indicate easier marketability compared to a crop with a higher average.

The marketing of most organic vegetables, herbs, and row crops was reported to be "easy" or "difficult but manageable." Average marketing difficulty was lowest for chard, corn, and beets followed by lettuce and greens and Brassica crops. Carrots and cucumbers followed in ease of marketing.

The most difficult crops to market were herbs, potatoes, seeds, and flowers. Marketing of squash, herbs, and potatoes was reported to be "hard" on one survey each; however, other surveys said that these crops were "easy" to market or "difficult but manageable."

The crop category "Other" included sunchokes (hard to market), specialty vegetables and locally produced vegetables (difficult but manageable), and processed (dried) crops (impossible). The difficulty in marketing processed crops was reported as due to the cost of implementing laws dealing with food processing.

Table 22. Marketing Difficulty for Some Organic Crops and the Number of Surveys Reporting for Each Crop

	Degree of Difficulty					
Crop Species	(1) Easy	(2) Manageable	(3) Hard	(4) Impossible	Average Difficulty	No. of Surveys
Lettuce & greens	3	2	0	0	1.40	5
Brassica[1]	3	2	0	0	1.40	5
Alliums[2]	2	3	0	0	1.60	5
Squash[3]	2	2	1	0	1.80	5
Tomatoes	1	4	0	0	1.80	5
Carrots	2	2	0	0	1.50	4
Peppers & Chilis	1	3	0	0	1.75	4
Herbs	1	1	1	0	2.00	3
Potatoes	1	1	1	0	2.00	3
Corn, sweet	2	0	0	0	1.00	2
Chard	2	0	0	0	1.00	2
Cucumbers	1	1	0	0	1.50	2
Beets	1	0	0	0	1.00	1
Seeds	0	1	0	0	2.00	1
Flowers	0	1	0	0	2.00	1
Other	0	2	1	1	2.75	4

[1]Cabbage, cauliflower, broccoli, kale

[2]Onion, garlic, leeks

[3]Summer, winter

Question 42: What market strategy has worked the best for your operation?

Check and rank all that apply. (Rank: 1 = Very Successful, 2 = Moderate Success, 3 = Limited Success, 4 = Not Successful, N/A = Not Applicable)

The responses to Question 42 show various marketing strategies, the numbers of growers that reported experience with each strategy, and a ranking of the success of their strategies (Table 23). For example, 18 growers tried marketing through farmers' markets. Ten growers found this to be very successful, and one grower was not successful. Seven growers had moderate or limited success with this strategy. The numerical ranks for degree of success were averaged for each market strategy to provide a rough comparison between strategies.

Farmers' markets, the most highly used marketing strategy, were reported by 86% of survey respondents and 56% said this was a very successful strategy. Direct sales to retailers such as organic food stores and restaurants was reported on 76% of the surveys and was mostly moderately successful. The reported success with wholesale marketing was similar to direct retail marketing.

Community supported agriculture was reported on 52% of the surveys. This strategy commonly involves an advance payment for which the payer receives periodic deliveries of the crop as it becomes marketable. Of those using this strategy, 55% reported it to be very successful.

Results show that many growers have tried multiple strategies. It is beyond the scope of this report to comment on the reasons for the degrees of success that were reported.

Table 23. Marketing Strategies Used by Growers of Organic Vegetables, Herbs, and Row Crops, the Successfulness of Each Strategy, and the Number of Growers Reporting Each Strategy

	Degree of Success					
Market Strategy	(1) Very	(2) Moderate	(3) Limited	(4) Not	Average Success	No. of Surveys
Farmers' Market	10	3	4	1	**1.78**	18
Direct to Retailers	6	7	3	0	**1.80**	16
Wholesale	6	3	3	2	**2.08**	14
Community Supported Agriculture	6	2	3	0	**1.60**	11
Cooperative	3	2	1	2	**2.29**	8
Farm Stand	3	0	0	3	**2.50**	6
Direct to Institutions	1	2	2	1	**2.60**	6
U-pick	1	0	3	0	**2.50**	4
Direct to Consumers	1	1	0	0	**1.50**	2
Direct to Processors	1	0	1	0	**2.00**	2
On-line	0	1	1	0	**2.50**	2
Broker/Resellers	0	0	0	1	**4.00**	1

Question 43: Do you feel there are accessible markets for all your organic production?

____Yes ____No

The responses to this question were as follows:

Yes 14 (67%)
No 5 (24%)
No Response..... 2 (9%)

A majority of growers reported the existence of accessible markets. However, two growers reported that, other than farmers' markets, very few marketing opportunities exist. Two other growers reported that the demand for organic production is limited or undeveloped which required them to limit production. One grower reported possible confusion in the marketplace caused by consumer misunderstanding of the differences between local and organic production. While it is beyond the scope of this report to comment on factors that limited market accessibility, these comments suggested some needs for market assistance and development.

Question 44: What marketing research do you feel is most needed?

Twelve surveys included answers to Question 44, and eight surveys had no relevant answers. One survey suggested that no research was necessary. Twelve suggestions for research or education, summarized below, were gleaned from the responses. The number of surveys that repeated each suggestion is shown in parentheses.

1. Develop markets by educating consumers about the benefits of organic food production and consumption (4 surveys),
2. Develop processing procedures and facilities for organic foods (3 surveys),
3. How can small-scale producers extend the "market season" beyond the "fresh pick" season (2 surveys),
4. Opportunities exist for developing markets among grocery stores, restaurants, etc. in Western Montana where competition exists among growers for a small, undeveloped market (1 survey),
5. Create a food shed map of Montana that includes schools, institutions, stores, etc. that will use organic food (1 survey),
6. Assistance in understanding and influencing regulations for small-scale growers who process their production (1 survey).

The most common suggestion was to develop markets by educating consumers (rather than doing research) about the benefits of organic food and the differences between organic and conventional food and production systems. Growers commented that education materials should incorporate legitimate information and studies about nutrition, chemical residues, shopping, preserving, safety and health, and crops.

Growers commented that food production is not a problem, but value-added processing is lacking. One grower commented that adding value to raw products could extend marketing throughout the year.

Suggestions about extending the market season were closely related to value adding. Growers looked for ways to extend marketing before and after "farmers' market seasons," and suggestions included cooperatives and shared facilities to process and store production.

Summary

Question 45: Have you taken acres out of organic production, and if so, why?

The responses to this question were as follows:

Yes 0 (0%)
No 19 (90%)
No Response..... 2 (10%)

Results for Question 45 did not indicate any trend to reduce organic acreage or to convert it to non-organic production. In its publication, *Organic Matters*, The Montana Organic Association (2012) reported the conversion of organic small grains acreage to non-organic acreage, due largely to difficulty controlling bindweed. While vegetable, herb, and row crop growers report bindweed as the top weed problem (see Question 22), it was not apparent that acreage was converted from organic to non-organic due to this issue.

Question 46: What specific research would have the most impact on your organic production system?

Fifteen surveys included answers to Question 46. Fourteen suggestions for research or education are summarized below. The number of surveys that repeated each suggestion is shown in parentheses.

1. Develop strategies for managing field bindweed in organic systems (3),
2. Assist with developing markets including those with consumers and institutions (3),
3. What ways do cover crop and green manure mixes benefit future crops and soil health? Can cover crops adjust soil alkalinity? (3),
4. Organic approaches for controlling Canada thistle (2),
5. Organic control of quack grass, specifically in uncultivated areas, and using non-mechanical methods (2),
6. Organic control of insects in controlled environments such as green houses and hoop houses (2),
7. What are the relationships between pastured poultry flock density and soil fertility? (1),
8. How can livestock be integrated with vegetable production? (1),
9. Develop varieties that are suitable for short growing seasons (1),
10. Safe, practical pest and weed management tools that are farmer-produced, considering naturally occurring phytotoxins and allelopathy (1),
11. Ways to reduce time and labor in vegetable, herb, and row crop production (1),
12. Organic control of Russian thistle (1),
13. Organic methods to control Sclerotinia and White Rot in soil (1),
14. Develop cheap, reliable fuel alternatives (1).

Question 47: Have you noticed any links between crops, nutrients, insects, or weeds, which you would like to see more research on?

Six surveys described links that were observed, and these descriptions are summarized below:

1. Field bindweed seemed suppressed in alfalfa-grass hay. Would alfalfa-grass hay in the vegetable rotation help to reduce bindweed presence?
2. Cover crops in the rotation help to manage weeds.
3. A relationship exists between crop integration (diversity, type, etc.) and beneficial insects.
4. Poultry integrated with crops can benefit soil fertility and pest and weed control.
5. The presence of host weeds such as thistles and plantain is associated with Aster Yellows in carrots.
6. The presence of insects is related to diseases in potatoes.

Other surveys, while not commenting on observed links, described a desire to move toward "ecological farming," and to utilize plant-produced substances for pest control.

Question 48: What educational efforts/topics do you deem most important/ beneficial in advancing your organic farm production?

While the responses for many prior survey questions included suggestions for education, Question 48 provided an opportunity for respondents to specifically address educational needs. Such needs might be addressed through school curricula, by the MSU Cooperative Extension Service, by nonprofit organizations serving the organic community, by certifiers, and others. Educational topics from Question 48 are presented below with the number of surveys suggesting each topic included in parentheses:

1. Education for consumers about organic food (4),
2. Organic methods to build soil quality and fertility in market gardens and raised beds, including integrated livestock to build fertility (3),
3. Marketing strategies for organic vegetables, herbs, and row crops (2),
4. Ecological principles to promote connections in cultivated systems (1),
5. Reducing the labor in weed control (1),
6. Hands-on field trips and internships at organic farms (1),
7. Crop rotation strategies for vegetable production and small acreage market gardens (1),
8. Organic plant breeding, seed production, and seed improvement (1),
9. Integrated pest management (1),
10. The Farm to School program (1),
11. Information and awareness about genetically modified organisms (1),
12. Correcting alkaline irrigation water (1).

Question 49: Other comments. Please add any comments you feel are relevant to this survey.

One respondent commented about the presence of abundant and helpful information on organic production that is already available from universities and other sources. The respondent encouraged growers to seek and apply this information and suggested implementation of educational efforts to assist growers in accessing this information.

Another grower commented that growing food was the easy part of the job, while selling it was the more challenging part. It was suggested that more education is needed to help consumers understand the benefits of organic food and to make it affordable and available year around.

REFERENCES

Grisak, A. 2012. Where have all the grain growers gone? Montana Organic Association Newsletter, Organic Matters, Vol. 9, Issue 1. 13 pp.

Lavin M. and C. Seibert. 2011. Grasses of Montana. Department of Plant Sciences and Plant Pathology, Montana State University, Bozeman, MT. 65 pp.

Metcalf, C. L., W. P. Flint, and R. L. Metcalf. 1962. Destructive and Useful Insects. McGraw-Hill Book Company. 1087 pp.

USDA. 2013. National Organic Program website. http://www.ams.usda.gov/nop/

USDA, Agricultural Research Service. 1971. Common Weeds of the United States. Dover Publications, Inc. 463 pp.

Wallace, J. (ed.). 2001. Organic Field Crop Handbook, A Project of Canadian Organic Growers Inc. Mothersill Printing. 292 pp.

Westcott, C. 1971. Plant Disease Handbook. Van Nostrand Reinhold Co. 843 pp.

Appendix

OAEC

762 Danvers Rd
Lewistown, MT 59457
406-538-3607
mtoaec@hotmail.com

The Organic Advisory and Education Council is a 501(c)(3) non profit organization, which encourages sustainable and responsible organic agricultural practices, through investments in research and education.

OAEC – Vegetable, Herb and Row Crop Producer Research Survey

The Organic Advisory and Education Council is surveying Montana producers to determine the greatest challenges in organic production systems. Please make your voice heard by participating in this data collection, and helping us steer future research where it is needed. If you would like to keep your answers completely confidential, please indicate so below, and your survey results will be handled separately from this cover page, as OAEC respects your willingness to participate in this survey, and your privacy, by keeping information anonymous. Alternatively, OAEC will be a link for researchers, seeking direct farmer research projects and consultations. If you are willing to openly share your answers with the research community, please indicate so below. We also ask that you answer all the questions you can, to the best of your ability, as missing information will dilute our findings. Thank you for your support.

First name: _____

Last name: _____

Farm name: _____

Address: _____

Phone: _____

Email: _____

Date: _____

1. How would you like your name handled with your survey answers? (Circle One)
1. Open to the Research Community
2. Strictly Confidential
2. May OAEC contact you for support of future research programs? (Circle One)
1. Yes I am interested to learn more about future research programs
2. No I do not want to be contacted about future research programs
3. May OAEC send you news updates via email? (Circle One)
1. Yes I am interested to hear updates via email
2. No I do not want to be contacted via email
4. Would you be interested in participating in organic research on your farm? (Circle One)
1. Yes I would consider participating in a research program on my farm
2. No I do not have interest in participating in any research programs
5. Please explain any "on farm" research you are currently conducting on your own:

INSTRUCTIONS: MULTIPLE CHOICE QUESTIONS PLEASE ANSWER BY CIRCLING WHICH ONE BEST APPLIES. SOME QUESTION MIGHT ASK YOU TO RANK THE DEGREE OF DIFFICULTY. FOR ESSAY TYPE QUESTIONS, OR IF YOU WOULD LIKE TO ELABORATE ON ANY QUESTION, PLEASE PROVIDE AS MUCH INFORMATION AS YOU DESIRE. IF YOUR OPERATION IS MIXED ORGANIC AND NON-ORGANIC, PLEASE ANSWER THE SURVEY FOR YOUR ORGANIC PRODUCTION ONLY. THANK YOU.

General

1. What county or counties do you primarily operate in? (Please Explain)

2. How long have you been growing organic crops? (Circle One)
    1. Now in Transition
    2. 1-3 years
    3. 4-6 years
    4. 7-10 years
    5. 11-20 years
    6. >20 years

3. Is your farm all organic or mixed organic and non-organic? (Circle One)
    1. All organic
    2. Mixed

4. How large is your organic production area? (Circle One)
    1. less than one acre
    2. 1-10 ac
    3. 10-50 ac
    4. 50-100 ac
    5. 100-500 ac
    6. 500-1000 ac
    7. 1000-2000 ac
    8. 2000-5000 ac
    9. >5000 ac

5. What is the primary make up of your soil structure? (Please Explain)

6. What tillage practices are most effective in managing soil conservation? (Please Explain)

7. What is the most challenging agronomic issue for your organic operation? (Please Explain)

Crops in your organic operation:

8. What crops do you grow? Check all that apply.
    1. Vegetables
    2. Herbs
    3. Bedding plants
    4. Seeds
    5. Flowers
    6. Other (describe)_____

9. List up to 12 crops you have produced and rank each in terms of the success of production. Be specific as to crop name. (Rank: 1 = Very Successful, 2 = Moderate Success, 3 = Unsuccessful,)
    1. 4.
    2. 5.
    3. 6.

7. 10.
8. 11,
9. 12.

10. Rank each of the following factors in terms of their influence on your yields. (Rank: 1 = Major Influence, 2 = Moderate Influence, 3 = Minor Influence, 4 = No Influence, N/A = Not Applicable)
    _____Weeds
    _____Diseases
    _____Soil Fertility/nutrient deficiencies
    _____Pests
    _____Varieties of seed
    _____Rainfall
    _____Others (Please Describe and Rank):

11. Describe the crops (vegetables, seeds, legumes, forages, green manures, etc.) that are in your rotation and their sequence.

12. What factors influence your selection of crop rotations? (Please Explain)

Green Manure/Cover Crops in your organic operation:

(Note: Some call it green manure, some call it cover crop, here we use the term green manure)

13. Have you grown a green manure crop as part of your rotation? (Circle One)
    1. Yes
    2. No

14. Please list the crops grown as green manure?

15. How much of your cropland is in green manure each year? (Circle One)
    1. <10%
    2. 10-20%
    3. 20-30%
    4. 30-40%
    5. 40-50%
    6. >50%

16. What are greatest benefits of your green manure crops? (Rank: 1 = Great Benefit 2 = Moderate Benefit, 3 = Limited Benefit, 4 = No Benefit, N/A = Not Applicable)
    1. _____Build soil fertility
    2. _____Improve soil structure
    3. _____Control weeds
    4. _____Break weed, disease, or insect pest cycles
    5. _____Reduce soil erosion
    6. _____Other (Describe and rank):

17. What are your biggest challenges with your green manure production? (Please Explain)

18. Was terminating the green manure an issue? Yes or No (Circle One). How do you terminate green manure crops? (Please Explain)

19. Do you think green manure compromises soil moisture and nutrient availability? (Please Explain)

20. Would you consider incorporating livestock to manage green manure/cover crops? (Circle One)
    1. Yes
    2. No
    3. Maybe
    4. Already use livestock for this purpose
    5. Other (Please Explain):

Weeds in your organic operation:

21. List the crops on your farm that are adversely influenced by weeds and rank each crop in terms of the degree of influence. (Rank: 1 = Major Influence, 2 = Moderate Influence, 3 = Minor Influence, 4 = No Influence, N/A = Not Applicable)
    1. 7.
    2. 8.
    3. 9.
    4. 10.
    5. 11.
    6. 12
22. List up to 10 weed species on your farm and rank how hard they are to manage: (1=Easy, 2=Difficult but Manageable, 3=Hard, 4=Impossible)
    1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

23. Would you consider incorporating livestock to manage weeds?
    1. Yes
    2. No
    3. Maybe
    4. Already use livestock for this purpose
    5. Other (Please Explain):

24. What weed research do you feel is most needed? (Please Explain)

Diseases in your organic operation:

25. List the crops on your farm that are adversely influenced by diseases, and rank each crop in terms of the degree of influence. (Rank: 1 = Major Influence, 2 = Moderate Influence, 3 = Minor Influence, 4 = No Influence, N/A = Not Applicable)
    1. 2. 3. 4. 5. 6. 7. 8. 9.
26. List up to 5 diseases on your farm and how hard they are to manage: (1=Easy, 2=Difficult but Manageable, 3=Hard, 4=Impossible)
    1. 2. 3.

4.
5.

27. What diseases research do you feel is most needed? (Please Explain)

Pests in your organic operation:

28. List the crops on your farm that are adversely influenced by insects, and rank each crop in terms of the degree of influence. (Rank: 1 = Major Influence, 2 = Moderate Influence, 3 = Minor Influence, 4 = No Influence, N/A = Not Applicable)
    1.
    2.
    3.
    4.
    5.
    6.
    7.
    8.
    9.

29. List up to top 5 insects you see, and how hard they are to manage: (1=Easy, 2=Difficult but Manageable, 3=Hard, 4=Impossible)
    1.
    2.
    3.
    4.
    5.

30. What pest research do you feel is most needed?

Soil Nutrition in your organic operation:

31. Do you do soil fertility and foliar testing? (Circle One. If #4 skip to Question 37)
    1. Yes, both
    2. No, just soil
    3. No, just foliar
    4. No testing done

32. How frequently do you do soil testing? (Circle One)
    1. Every year:
    2. Every 2 years:
    3. 3-4 years:
    4. 4-5 years:
    5. > 5 years:

33. How frequently do you do foliar testing? (Circle One)
    1. Twice a year
    2. Every year:
    3. Every 2 years:
    4. 3-4 years:
    5. 4-5 years:
    6. > 5 years:

34. At what density do you do soil testing? (Circle One)
    1. Every Field
    2. Most Fields
    3. Few Fields
    4. Other (Please Explain):

35. At what density do you do foliar testing? (Circle One)
    1. Every Field
    2. Most Fields
    3. Few Fields
    4. Other (Please Explain):
36. Do you believe you have nutrient deficiencies in your soil? (Circle One)
    1. Yes
    2. No
    3. Don't Know

37. If you know, list the top 5 nutrient deficiencies affecting your organic crops:
    1.
    2.
    3.
    4.
    5.

38. How do you address the deficiencies in your soils? (Please Explain)

39. What factors determine whether you add approved fertilizers or not? (Please Explain)

40. What soil fertility research do you feel is most needed? (Please Explain)

Marketing issues in your organic operation:

41. List the crops that face the biggest challenge to market? (Rank: 1=Easy, 2=Difficult but Manageable, 3=Hard, 4=Impossible, N/A = Not Applicable)
    1.
    2.
    3.
    4.
    5.
    6.
    7.
    8.
    9.
42. What market strategy has worked the best for your operation? Check and rank all that apply. (Rank: 1 = Very Successful, 2 = Moderate Success, 3 = Limited Success, 4 = Not Successful, N/A = Not Applicable)
    1. _____Farmers' market
    2. _____U-pick
    3. _____Farm Stand
    4. _____Community supported agriculture
    5. _____Cooperative
    6. _____Direct to retailers (stores, restaurants..)
    7. _____Direct to institutions
    8. _____Wholesale

9. _____Direct to Food Processors
10. _____Broker/Resellers
11. _____Other (Describe):

43. Do you feel there are accessible markets for all your organic production? (Please Explain)
    _____Yes
    _____No

44. What marketing research do you feel is most needed? (Please Explain)

Summary

45. Have you taken acres out of organic production, and if so, why? (Please Explain)
    _____Yes
    _____No

46. What specific research would have the most impact on your organic production system? (Be as specific as possible. For example, "Determine what crops are competitive with weed x" or "Determine what cropping system will replenish x nutrient in my soil")

47. Have you noticed any links between crops, nutrients, insects, or weeds, which you would like to see more research on? (Please explain)

48. What educational efforts/topics do you deem most important/beneficial in advancing your organic farm production?

49. Other comments. Please add any comments you feel are relevant to this survey.

Thank you for completing this survey, and for your continued support of the OAEC! Please provide any feedback you may have about this survey, its format, or content on the back of this page.

Organic Advisory and Education Council
762 Danvers Road
Lewistown, Montana