SUPPLEMENTARY FILE 1: Additional tables and figures.

Table S1. Coding used for percent clay and percent silt soil types for correlations in Table S.2.

	Percent Clay[§]	**Percent Silt** [§]
1	sand	sand
2	loamy sand	loamy sand
3	sandy loam	sandy loam
4	loam	sandy clay loam
5	silt loam	sandy clay loam
6	silt	clay
7	sandy clay loam	clay loam
8	clay loam	loam
9	silty clay loam	silty clay
10	sandy clay	silty clay loam
11	silty clay	silt loam
12	clay	silt

§ Numbers based on farmer responses in soil texture traingle.

*Muck or other soil types were eliminated from correlation

Table S2. STIR values used for tillage operations reported by organic farmer respondents for crop production.

Survey Option*	RUSLE Tillage Operation	STIR value
Spader	Spader	18.00
Fingerweeder	Weeder, fingerweeder	0.49
Striptiller	Subsoiler, in row strip conditioner, 40 in. row	11.00
Bed former	Bed shaper	20.00
Flextine	Harrow coiled tine	16.00
Harrow	Spike tooth	16.00
Rotary hoe	Rotary cultivator	6.60
Row cultivator	Field cultivator 6-12 sweeps	26.00
Disk	Plow Disk	39.00
Field cultivator	Cultivator, with spike and coil tines	34.00
Rototiller	Rototiller (with adjusted depth)	18.00
Chisel plow	Chisel plow	53.00
Moldboard plow	Moldboard plow	65.00
Soil finisher	Combination of:	25.80
	Coulter tiller and spike harrow	19.00
	Rolling basket	6.80

* Options that farmers selected on survey.

**Category selection paired with from Revised Universal Soil Loss Equation 2 and associated STIR value.

Table S3. Spearman correlation coefficients between respondent expressed interest in reduced till adoption and farm and farmer characteristics, as well as the perceived barriers and benefits of RT adoption.

	Expressed Interest in Adoption					
	No-till	**Rotational**	**Strip-till**	**Permenant Beds**	**Ridge-till**	**Max Interest[§]**
Farm and Farmer Characteristics						
Years Farming	**-0.229***	-0.156	**-0.308****	**-0.372****	-0.038	**-0.259***
Percent of week spent farming	0.146	0.156	**0.208***	0.077	**0.231***	0.111
Percent of income from farming	-0.036	0.018	0.036	-0.171	-0.021	-0.095
Acres farmed (2013)	-0.135	0.008	-0.089	**-0.381****	-0.034	-0.182
Total number of tillage operations	-0.160	0.018	-0.088	**-0.344****	-0.021	-0.189
Percent clay†	**-0.247***	-0.087	-0.121	**-0.239***	0.076	**-0.245***
Percent silt†	**-0.256***	-0.064	-0.143	**-0.299****	0.015	**-0.251***
Knowledge of Specific RT Practices	**0.270****	**0.240***	**0.389****	**0.456****	0.109	—
Barriers to Adoption						
Equipment Cost	-0.001	0.207	0.059	0.111	0.110	0.137
Scale Appropriate Equipment	0.006	0.088	0.096	**0.208***	0.180	0.114
Information is lacking	0.134	0.209	0.145	**0.254***	**0.263***	**0.261***
Learning new practice	0.104	0.112	0.125	0.122	0.121	0.116
Labor costs	-0.128	-0.129	-0.124	-0.071	-0.039	-0.181
Decreased Yields	**-0.314****	-0.092	**-0.290****	-0.165	-0.056	**-0.217***
Soil Fertility	**-0.245***	-0.113	-0.164	-0.066	-0.125	**-0.222***
Residue management	**-0.343****	-0.12	**-0.229***	-0.177	**-0.296****	**-0.216***
Crop Establishment	**-0.297****	-0.162	-0.141	-0.182	-0.191	-0.154
Insect Pressue	-0.169	-0.052	-0.154	-0.188	-0.079	**-0.236***
Disease Pressue	-0.130	0.039	-0.11	-0.164	0.018	-0.154
Weed Competition	**-0.372****	**-0.241***	**-0.361****	**-0.342****	-0.186	**-0.362****
Benefits to Adoption						
Fuel Savings	**0.476****	**0.316****	**0.385****	**0.344****	**0.224***	**0.481****
Labor Reduction	**0.492****	**0.352****	**0.345****	**0.254***	**0.255***	**0.455****
Increased Yields	**0.573****	**0.375****	**0.434****	**0.328****	**0.242***	**0.514****
Decreased Erosion	**0.389****	**0.359****	**0.326****	**0.250***	0.163	**0.436****
Increased Soil Organic Matter	**0.506****	**0.399****	**0.415****	**0.335****	**0.307****	**0.538****
Improved Soil Tilth	**0.586****	**0.460****	**0.452****	**0.398****	**0.329****	**0.593****
Reduced Compaction	**0.557****	**0.409****	**0.432****	**0.396****	**0.262***	**0.588****
Improved Water Infiltration	**0.464****	**0.400****	**0.290****	**0.304****	**0.336****	**0.481****
Increased Water Holding Capacity	**0.522****	**0.349****	**0.368****	**0.346****	**0.272***	**0.511****
Lower Insect Pressure	**0.608****	**0.360****	**0.396****	**0.358****	**0.330****	**0.540****
Reduced Disease Pressure	**0.557****	**0.262***	**0.326****	**0.314****	**0.242***	**0.442****
Reduced Weed Pressure	**0.595****	**0.328****	**0.234***	**0.332****	0.160	**0.447****

**Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

† Percent clay and percent silt are the maximum of all soil types respodents stated were present on their farm.

§ Max interest is the maximum express interest for adoption of any form of reduced-tillage.

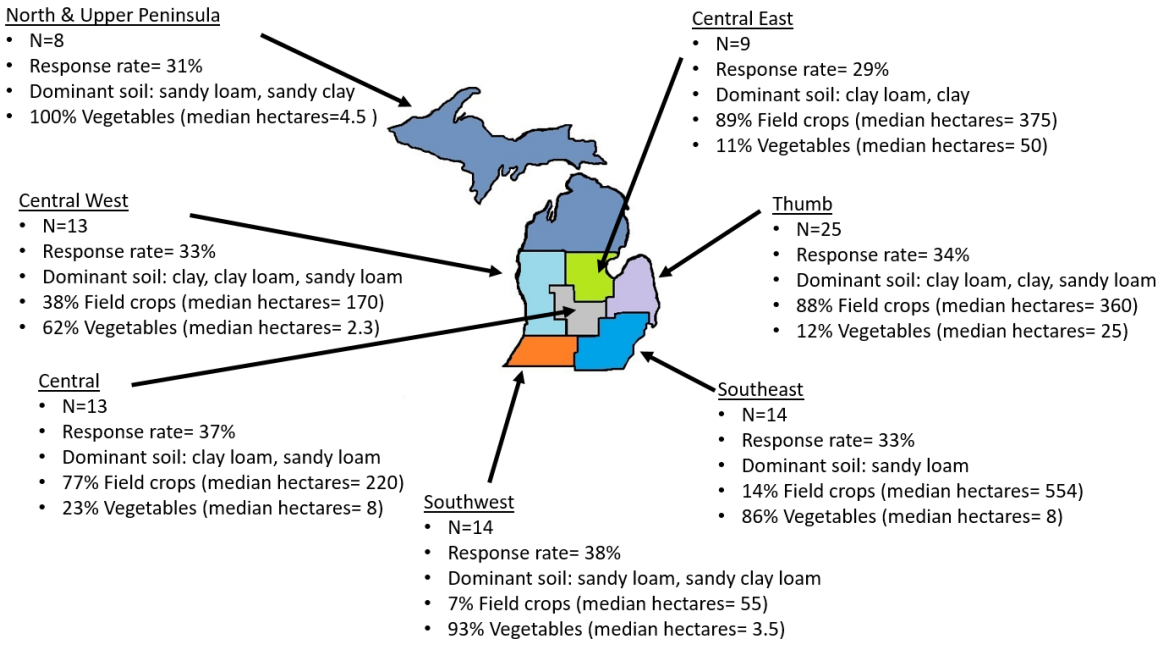


Figure S1. Number of respondents, response rate, dominant soil and crops, as well as median farm size of survey respondents by Michigan region.

Supplementary File 2: The following is an example of the survey we disseminated to organic field crop producers in Michigan.

Section 1: Farm Characteristics:

1. How many years have you been farming?
   ___ 5 years or less ___ 6 to 10 years ___ 11 to 15 years ___ 16 to 20 years
   ___ 21 to 30 years ___ 31 to 40 years ___ 41 to 50 years ___ over 50 years

2. How many years have you been farming using organic methods or practices?
   ___ 5 years or less ___ 6 to 10 years ___ 11 to 15 years ___ 16 to 20 years
   ___ 21 to 30 years ___ 31 to 40 years ___ 41 to 50 years ___ over 50 years

3. Which category best describes you *(please check one)*:
   owner of farm operation on owned land_____
   owner of farm operation on rented land_____
   manager of farming operation_____
   owner of farm operation and partial land owner_____

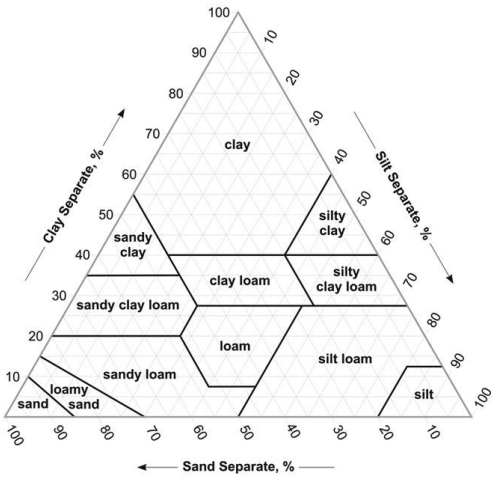
4. Are you organically certified... yes or no? _____

5. What percent of a typical workweek do you devote to farming? _____

6. In 2013, what percentage of your net family income came from farming?

   ___ 1 to 25% ___ 26 to 50% ___51 to 75% ___ 76 to 100%

7. How would you describe the soil type on your farm: *Please mark an 'X' on the triangle below where you think your farms soil type best fits* (if more than one - please mark multiple X's)



Other soil types (e.g. peat, muck) please fill in here_____

8. How many total acres did you have in production of all **cash crops** *(any field or vegetable crop grown for sale)* in the following years? *Please specify if you can remember…*

   2013: _____ 2012: _____

9. What equipment is currently available to you (own, rent, borrow)? See page 11-12 for pictures of these tools. *Please check all that apply*.

Tillage Equipment	**Check**	**Tillage Equipment**	**Check**
Moldboard plow		Field cultivator	
Chisel plow		Row crop cultivator	
Rototiller		Flextine weeder	
Disc		Rotary hoe	
Harrow (spring or spike tooth)		Regi weeder (=ECO weeder)	
Soil Finisher		Finger weeder	
Spader		Basket weeder	
Bed former		Rolling cultivator	
Strip tiller			
Other (specify) _____		Other (specify)_____	
Other (specify) _____		Other (specify)_____	
Other (specify) _____		Other (specify)_____	

10. Do you own a tractor.... yes or no? _____

11. If yes, please list the model and horsepower range on separate lines...

Model	Horsepower
_____	_____
_____	_____
_____	_____
_____	_____

12. How does your farm's gross sales break down by product type (e.g. 10% vegetables; 50% livestock; 40% hay)?

___ vegetables ___ hay ___ beans
___ tree fruit ___ livestock ___ grains
___ small fruit
___ other (please list: _____)

13. Please list all of the cover crops you have grown on your farm in the past two years; list cover crops in order from those with the greatest land area to those with the least.

1. _____ 5. _____
2. _____ 6. _____
3. _____ 7. _____
4. _____ 8. _____

Section 2: Standard practices

The goal of this section is to characterize specific practices used by organic farmers. In order to do this, we would like to look in depth at typical production inputs and operations for only **ONE** crop grown on your farm. It may be helpful to have your farm records on-hand.
Please choose *(and circle)* 1 of the crops below.

Field corn OR Soybean OR Dry bean

For the following questions, please specify the practices you employed in 2013 within the crop selected above. Refer only to the acreage of that crop produced according to organically certified practices.

1. How many total acres *(of the crop selected above)* did you grow in 2013?

2. How many acres *(of the crop selected above)* did you grow in 2013 according to organic guidelines?

3. What was planted in the area preceding this crop?
   Please list the cash crops that preceded this crop starting with the most recent …

   2012 crop _____

   2011 crop _____

4. What will be planted in the area after this crop?
   Please list the two crops that will most likely follow this crop starting with the most recent …

   2014 crop _____

   2015 crop _____

Organic Production Worksheet for Field Crops

Field preparation:

What forms of tillage did you utilize to prepare the field before planting the selected crop? *Please specify the number of passes for each implement used…*
Refer to p. 10-11 for pictures of common tillage implements.

Tillage type	**# passes *(may be a range)***
Moldboard plow	
Chisel plow	
Rototiller	
Strip till	
Ridge till	
Spader	
Disc	
Harrow	
Bed former	
Soil Finisher	
Other: *(please specify)*	

Soil Amendments: Please specify rates in specific units: lbs/acre; ft^3/ ft^2; $yards^3$/ ft^2 What soil amendments (if any) did you apply to improve crop productivity?	**Rate Applied:**
- Manure	
- Compost (purchased off farm)	
- Compost (made on farm)	
- Commercial organic fertilizer	
If you used a preceding cover crop, please specify which:	
Please list which commercial fertilizers (if any) you applied:	

Weed Management	**Response:**
Cultivation. ***Please specify the number of cultivation events for each cultivation type (see pictures on page 10-11):***	**# cultivation events (may be a range)**
Flextine weeder	
Rotary hoe	
Regi weeder (=ECO weeder)	
Finger weeder	
Basket weeder	
Rolling cultivator (e.g. Lilliston cultivator with spider gangs)	
Row crop cultivator (e.g. S-tine cultivator with sweeps)	
Other: _____	
Other: _____	
Other: _____	
Organic herbicides:	**Response:**
Did you use organically approved herbicides on the selected crop?	
If yes, … *please specify*	
number of applications	
which herbicide products were used?	
timing of herbicide application during crop growth ?	
Flame Weeders	
Did you flame weed the selected crop?	
If yes, … *please specify*	
number of events	
timing of flame weeding during crop growth ?	

Pest Management (all pests but weeds):	**Response:**
How many insecticide applications did you make to your selected crop?	
How many times did you apply disease control products?	
Please list which products (for insects or disease) were used on the selected crop:	

Labor:	**Number of hours:**
Approximately how many hours in total were spent performing the following activities in your selected crop…. *please specify in either total hours or hours/ acre*	
field preparation	
planting	
weeding by hand or with hoe	
scouting and spraying products	
side-dressing	
irrigating	
harvesting	
Other:	

5. If you eliminated your primary tillage for the selected crop, what do you think would be the primary challenge, if any?

   _____

6. If you transitioned your primary tillage within the selected crop to strip-tillage (tillage in narrow strip only where the crop is planted), what do you think would be the primary challenge, if any?

   _____

7. Are there other crops grown on your farm that you think would be better suited for reduced-till practices? If yes, which ones?

   _____

Section 3: Attitudes towards tillage

1. How interested are you in implementing the following forms of reduced-till practices within **any** crop on your farm? *Please specify on a scale from 0 to 7…*

	Not at all	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Extremely**
Complete no till		0	1	2	3	4	5	6	7	
Rotational tillage		0	1	2	3	4	5	6	7	
(till before certain crops and not before others)										
Strip or Zone tillage		0	1	2	3	4	5	6	7	
(till narrow strip directly where crop will be planted)										
Permanent bed systems		0	1	2	3	4	5	6	7	
(*establishment of tilled beds for the crop and untilled pathways between beds)*										
Ridge tillage		0	1	2	3	4	5	6	7	
(*shallow tillage that involves the formation and scraping of ridges*)										

other (*please specify*):_____

2. How knowledgeable do you feel you are regarding the use and implementation of the following reduced-tillage practices? *Please specify on a scale from 0 to 7…*

	No Knowledge	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very knowledgeable**
Complete no till		0	1	2	3	4	5	6	7	
Rotational tillage		0	1	2	3	4	5	6	7	
(till before certain crops and not before others)										
Strip or Zone tillage		0	1	2	3	4	5	6	7	
(till narrow strip directly where crop will be planted)										
Permanent bed systems		0	1	2	3	4	5	6	7	
(*establishment of tilled beds for the crop and untilled pathways between beds)*										
Ridge tillage		0	1	2	3	4	5	6	7	
(*shallow tillage that involves the formation and scraping of ridges*)										

3. What is the likelihood that the following benefits could result from reduced-tillage adoption? *Please specify on a scale from 0 to 7…*

	Not at all	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Extremely**
<u>Economics</u>										
Reduced fuel use		0	1	2	3	4	5	6	7	
Decreased labor costs		0	1	2	3	4	5	6	7	

Increased yields	0	1	2	3	4	5	6	7
Soils								
Reduced soil erosion	0	1	2	3	4	5	6	7
Increased soil organic matter	0	1	2	3	4	5	6	7
Improved soil tilth	0	1	2	3	4	5	6	7
Decreased soil compaction	0	1	2	3	4	5	6	7
Increased water infiltration	0	1	2	3	4	5	6	7
Increased soil water holding capacity	0	1	2	3	4	5	6	7
Pests								
Reduced insect pressure	0	1	2	3	4	5	6	7
Reduced disease pressure	0	1	2	3	4	5	6	7
Reduced weed pressure	0	1	2	3	4	5	6	7

Other *(please list)*

_____

4. What do you believe are the potential challenges or barriers that limit reduced-tillage adoption? *Please specify on a scale from 0 to 7…*

Not a barrier	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Extreme barrier**
Economics									
Cost of Equipment	0	1	2	3	4	5	6	7	
Lack of appropriate equipment (e.g. for small scale or diversified farms)	0	1	2	3	4	5	6	7	
Lack of information	0	1	2	3	4	5	6	7	
Challenge of learning new practices	0	1	2	3	4	5	6	7	
Increased labor costs	0	1	2	3	4	5	6	7	
Reduced yields	0	1	2	3	4	5	6	7	
Soils									
Soil fertility management	0	1	2	3	4	5	6	7	
Crop/cover crop residue management	0	1	2	3	4	5	6	7	
Poor crop establishment	0	1	2	3	4	5	6	7	
Pests									
Increased insect pressure	0	1	2	3	4	5	6	7	
Increased disease pressure	0	1	2	3	4	5	6	7	
Increased weed pressure	0	1	2	3	4	5	6	7	

Other (please list):

_____

Section 4. Research Objectives.

The goal of this section is to gain a better understanding of what agronomic research topics organic farmers feel would be most beneficial.

Pretend you are the deciding vote on a panel determining which organic research grants should be funded. It is your role to decide what outcomes of the proposed projects would be most beneficial in providing information for your farm, considering all grant proposals were of equal scientific merit. Below are a series of outcomes that would result from these research projects.

For each set of outcomes below, please rank in order of importance the outcomes that you feel would be most beneficial to organic farmers. 1=most important and 3= least important. Some options are duplicated.

1. Enhanced soil biological activity_____
   Reduced soil erosion _____
   Increased soil organic matter _____

2. Enhanced soil fertility _____
   Improved water drainage_____
   Increased soil water holding capacity_____

3. Reduced insect pressure _____
   Reduced disease pressure _____
   Reduced weed pressure _____

4. Enhanced soil biological activity_____
   Enhanced soil fertility _____
   Reduced insect pressure _____

5. Reduced soil erosion _____
   Improved water drainage_____
   Reduced disease pressure _____

6. Increased soil organic matter _____
   Increased soil water holding capacity_____
   Reduced weed pressure _____

Identify other specific production problems that you would like to see addressed through research:
_____
_____
_____
_____