NO-TILL
FOR SMALL SCALE VEGETABLE FARMS
LES MACARE, RACING HEART FARM
WHAT IS “TILLING”? 
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The preparation of land for growing crops.
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“Tilling the soil is the equivalent of an earthquake, hurricane, or flood. Simply stated, tillage is bad for the soil.”

-NRCS, “Farming in the 21st Century, A Practical Approach to Improving Soil Health”
WHAT IS “TILLING”? The preparation of land for growing crops.

WHAT IS NO-TILL?
WHAT IS “TILLING”?  
The preparation of land for growing crops.

WHAT IS NO-TILL?

???
WHAT IS “TILLING”? 
The preparation of land for growing crops.

WHAT IS NO-TILL?
Finding ways to prepare the soil for planting that minimizes the loss of Soil Organic Matter and keeps the soil horizon in place.
CARBON SEQUESTRATION AND CLIMATE CHANGE
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★ The earth’s soils contain more carbon than the atmosphere and all the plant life on earth.
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★ 55-60% of Soil Organic Matter is Soil Organic Carbon.
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★ Worms (and other macro-fauna) can move Soil Organic Carbon deeper into the soil than plant roots alone.
WORMS!

★ Castings have similar CEC to clay
★ Worms have a special relationship to white clover
★ Untilled soil has an average of 4 times more earthworms than tilled
★ Worms have a natural bio-reactor in their guts that increases beneficial microbes
★ Most local worms are non-native
★ You can take a worm census! 25 worms/SF = 1 million worms per acre!
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★ Climate change means it’s going to get harder to farm.
SOIL AND ORGANIC MATTER

★ In the US 2/3 of Soil Organic Matter has been farmed away
★ No-till can help increase Organic Matter, which will…
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   ★ Improve soil structure
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★ No-till can help increase Organic Matter, which will…
  ★ Improve soil structure
  ★ Increase water holding capacity
  ★ Increase nutrient uptake in plants
  ★ Increase soil biodiversity (bacteria and fungi)
BENEFITS OF NO-TILL
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★ Improve soil structure
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★ Improve soil structure
★ Increase Soil Organic Matter
BENEFITS OF NO-TILL

★ Improve soil structure
★ Increase Soil Organic Matter
★ Decrease weed pressure
BENEFITS OF NO-TILL

- Improve soil structure
- Increase Soil Organic Matter
- Decrease weed pressure
- Decrease pest and disease pressure
BENEFITS OF NO-TILL

★ Improve soil structure
★ Increase Soil Organic Matter
★ Decrease weed pressure
★ Decrease pest and disease pressure
★ Higher yields (with lower inputs)
OUR NO-TILL SYSTEM

Racing Heart Farm
Fields opened in 2017, 2018, and 2019
1.75 acres
100', 30” bed system
2 people
No tractor
OUR FARM GOALS

★ Grow nutrient dense food for ourselves and our customers

★ Build living soil

★ Increase total farm bio-diversity (above and below ground)

★ Create a system that is resilient in heavy rainfall and drought

★ Build a business that supports us in the present and helps us plan for the future

★ Farm intensively on a human scale: maximum living plant coverage with minimal mechanization
BASIC TOOLS

★ Soil test
BASIC TOOLS

★ Soil test
★ Broad-fork
BASIC TOOLS

- Soil test
- Broad-fork
- Bed rake
BASIC TOOLS

- Soil test
- Broad-fork
- Bed rake
- Landscape fabric
- Sod staples, 8"
- Propane weed torch
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- Basic seeder (Earthway)
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- Compost and some way to apply it
BASIC TOOLS

★ Soil test
★ Broad-fork
★ Bed rake
★ Landscape fabric
★ Sod staples, 8”
★ Propane weed torch
★ Basic seeder (Earthway)
★ Compost and some way to apply it
★ Simple weeding tools
BCS TOOLS

★ Model 853
★ Power Harrow
★ Larger/wider wheels
★ Flail Mower
★ Rotary Plow

★ Compost Spreader
★ Subsoiler
FANCY TOOLS

★ Jang Seeder (with disc opener)
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★ Paper Pot Transplanter
FANCY TOOLS

- Jang Seeder (with disc opener)
- Paper Pot Transplanter
- Gridder
FANCY TOOLS

★ Jang Seeder (with disc opener)

★ Paper Pot Transplanter

★ Gridder

★ Tilther
OPENING A FIELD

Year 1: Tarp or Landscape fabric

★ Soil test

★ Amend (minerals and micronutrients based on your soil test)

★ Add organic matter

★ Cover with tarp/fabric
OPENING A FIELD

Year 1: Tarp or Landscape fabric

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★ Amend (minerals and micronutrients based on your soil test)

★ Add organic matter

★ Cover with tarp/fabric

Year 2: Cash or cover crop

★ Remove tarp

★ Broadfork / key-line plow

★ Shape beds (re-tarp 3 weeks)*

★ Fertilize

★ Plant
KEEP THE SOIL COVERED

Cash Crop
KEEP THE SOIL COVERED

Cover Crop
KEEP THE SOIL COVERED

Organic mulch
KEEP THE SOIL COVERED

Landscape fabric or tarps
<table>
<thead>
<tr>
<th>LANDSCAPE FABRIC</th>
<th>SILAGE TARP</th>
</tr>
</thead>
<tbody>
<tr>
<td>➤ Air (and gasses) can move through</td>
<td>➤ Anaerobic</td>
</tr>
<tr>
<td>➤ Water can penetrate</td>
<td>➤ Collects water, or water runs off downhill</td>
</tr>
<tr>
<td>➤ Light, easy to move</td>
<td>➤ Heavy (extra heavy when dirty)</td>
</tr>
<tr>
<td>➤ Secure to ground with 8” staples</td>
<td>➤ Secure to ground with rocks/blocks/soil</td>
</tr>
<tr>
<td>➤ 3-4 cents per square foot</td>
<td>➤ 5 cents per square foot</td>
</tr>
<tr>
<td>➤ Durable</td>
<td>➤ Deer and mice can create holes</td>
</tr>
</tbody>
</table>
BED PREP / FLIP

★ Uncover (if covered) and assess OR
★ Remove crop debris and assess
CROP SPECIFIC BED FLIP STRATEGIES

Big Brassicas
Remove stems
Or
Flail mow
Or
Weed whack w/metal blade
CROP SPECIFIC BED FLIP STRATEGIES

**Fennel/Lettuce**

Open one side of fabric

Amend/compost

Shift fabric slightly and reattach so that you are planting between roots of previous crop

**Pepper/Eggplant**

Leave in place over winter

Pull out or cut out plants with loppers

Remove Fabric

**Winter Squash**
BED PREP / FLIP

★ Uncover (if covered) and assess OR
★ Remove crop debris and assess
★ Amend, fertilize (per soil test)
★ Compost
★ Broadfork (if needed)
★ Power Harrow (if needed)
BED PREP / FLIP

★ Uncover (if covered) and assess OR
★ Remove crop debris and assess
★ Amend, fertilize (per soil test)
★ Compost
★ Broadfork (if needed)
★ Power Harrow (if needed)
★ Mark rows or lay fabric
**BED PREP / FLIP**

- Uncover (if covered) and assess OR
- Remove crop debris and assess
- Amend, fertilize (per soil test)
- Compost
- Broadfork (if needed)
- Power Harrow (if needed)
- Mark rows or lay fabric
- Seed or plant
OTHER METHODS WE USE

★ Deep Compost Mulch
★ Cardboard Mulch

Perennial areas
Field edges
★ Raised Beds vs. non-raised
Hard to set up/maintain
Landscape fabric doesn’t fit
★ Hay/Straw mulch
Potatoes, Garlic, Broccoli
THINGS WE PLAN TO TRY IN 2020

- Marking beds with wooden stakes
- Clover pathways to mark beds
- Tilther
- Scytheing down crops or cover crops
- More intercropping as we reduce weed pressure
- More strategic cover cropping
- Planting into fabric then removing fabric after plants establish
- Use old hoop house plastic to solarize beds
NO-TILL IN ACTION

Reduced Weed Pressure
NO-TILL IN ACTION

Increased Soil Life
NO-TILL IN ACTION

Perennial cash crops: herbs, rhubarb, asparagus, apple trees
NO-TILL IN ACTION

Pollinator strips