I can’t believe it’s not butternut on plastic!
Year two cover crop and fertility observations

Ben Phillips, MSU Extension
Mike Yancho Jr, Forgotten Harvest Farm
Specialty Crop sustainability needs

- Conserve water
- Build soil
- Eliminate plastic from budget and farm environment
- Maintain yield
Year one: moisture conservation

- MDARD Specialty Crop Block Grant - $23,488
  - One year study comparing tillage, cover cropping and irrigation practice and their effect on water retention in winter squash
Year two: fertility

- Donation from ICL fertilizer and small MSU grant
Cover crop selection

- Winter Rye
  - Can plant in previous season
  - Accumulates biomass
  - Cheap and easy to get
  - Good rotation between veggies
  - Efficient nutrient scavenger
  - Strong root system…outcompetes weeds
Grain drill
$2800

Nothing special
Planted October 15, 2014
Target: 115 lb/ac
Actual: ~ 70 lb/ac

Lesson 1: calibration
Planted October 17, 2015
Target: 120 lb/ac
Actual: 120 lb/ac

Picture taken April 15, 2016
Burned down rye
May 25, 2015
May 27, 2016

Waist height and flowering
Rolling rye
June 3, 2015
June 2, 2016

I&J Roller crimper
With loader adapter

$4100
Chisel plowing and discing
June 10, 2015
June 4, 2016
Unverferth Zone-subsoiler from Dan Brainard

Bought 5-row unit for ~$2000 used
Cut into 1-row and-3 row implements

Yetter row cleaner

“Zone-building subsoiler”

“Strip-builder attachment”
Strip-tilling
June 5, 2015
June 8, 2016
2015 plots
Yellow = no-till
Red = strip-till
Blue = disced
Black = plastic

3 reps
2 irrigation trts

“Buy the biggest measuring tape”
2016 plots
Yellow = no-till
Red = strip-till
Blue = disced
4 reps
3 tillage trts
3 fertilizer trts
2016 plots

Yellow = no-till
Red = strip-till
Blue = disced

4 reps
3 tillage trts
3 fertilizer trts
Fertilizer treatments

- 67.76 lb actual N Controlled Release
- 47.16 lb actual N Controlled Release
- 59.69 lb actual N urea, DAP, K2SO4
### Hand planting observations, 2015

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Ease of seeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bare ground, no drip</td>
<td>3</td>
</tr>
<tr>
<td>No-till, no drip</td>
<td>4</td>
</tr>
<tr>
<td>No-till, drip</td>
<td>4</td>
</tr>
<tr>
<td>Strip-till, no drip</td>
<td>1</td>
</tr>
<tr>
<td>Strip-till, drip</td>
<td>1</td>
</tr>
<tr>
<td>Plastic, drip</td>
<td>2</td>
</tr>
</tbody>
</table>

*July 1, 2015*
Machine planting with June 10-13, 2016
Dual 5x5 dry fert
Hand planting observations, 2016

ICL Fertilizers
Hand planting observations, 2016
Hand planting observations, 2016
Weed control 2015

• Extra burn down waiting for weather and equipment, and wrong PRE timing in 2015
  • Dual Magnum before seeding

• Poor rye stand and delayed planting allowed germination of weeds in most plots
Weed control 2016

• 1 burn down, and right PRE right time in 2016
  • Sandea + Curbit + Command one day after planting, followed by 1/4” rain.

• Excessive tillage in bareground plots germinated lots of lambsquarters

• Poor seeding depth and delayed germination in no-till may have allowed weeds to out-compete
2016 season

No-till planted June 13
Picture taken July 14
2016 season

No-till planted June 13
Picture taken Sept 12
2016 season

No-till planted June 13
Picture taken Oct 7
2016 season

Strip-till planted June 13
Picture taken July 14
2016 season

Strip-till planted June 13
Picture taken Sept 12
2016 season

Strip-till planted June 13
Picture taken Oct 7
2016 season

Conventional-till planted June 13
Picture taken July 14
2016 season

Conventional-till planted June 13
Picture taken Sept 12
2016 season

Conventional-till planted June 13
Picture taken Oct 7
## Measured clean fruit

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Clean Fruit</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2015</td>
<td>2016</td>
<td></td>
</tr>
<tr>
<td>Bareground</td>
<td>20.89%</td>
<td>2.25%</td>
<td></td>
</tr>
<tr>
<td>No-till</td>
<td>33.21%</td>
<td>19.64%</td>
<td></td>
</tr>
<tr>
<td>Strip-till</td>
<td>22.43%</td>
<td>11.48%</td>
<td></td>
</tr>
<tr>
<td>Plastic</td>
<td>30.67%</td>
<td>7.76%*</td>
<td></td>
</tr>
</tbody>
</table>
## Yields

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Plants/Acre</th>
<th>Tons/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bareground</td>
<td>3775</td>
<td>5400</td>
</tr>
<tr>
<td>No-till</td>
<td>3086</td>
<td>4478</td>
</tr>
<tr>
<td>Strip-till</td>
<td>3666</td>
<td>7498</td>
</tr>
<tr>
<td>Plastic</td>
<td>4240</td>
<td>4329*</td>
</tr>
</tbody>
</table>

*Values marked with an asterisk are not included in the final results.
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Inorganic soil N ppm</th>
<th>Fertilizer cost/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 dap</td>
<td>60 dap</td>
</tr>
<tr>
<td>Hi-rate CRF</td>
<td>10.86 a</td>
<td>13.76 a</td>
</tr>
<tr>
<td>Lo-rate CRF</td>
<td>12.75 a</td>
<td>9.68 a</td>
</tr>
</tbody>
</table>

- CRF is $16.56 per 50 lb bag
- GSF is $14.25 per 50 lb bag
Lessons learned in year 1

- Calibrating cover crop drill
- Checking sprayer performance
- Right product, right time...herbicides
- Nitrogen was lacking
- Plastic...is pretty good

- Equipment total: ~$9000
Lessons learned in year 2

• Calibrate for at-plant fertilizer
• Repeated tillage flushes weeds
• Plant deeper in no-till
• Hi-rate controlled release offered a higher return, but not significant based on yield data
Thanks

- Ann, Nikita, Lori, Joe, Kevin, and Tom at Forgotten Harvest
- Work Force Development crews
- Dan Brainard, Markah Frost