Abstract
Winter wheat/soybean/pasture and winter rye/corn/pasture systems will be compared, and dairy steers will graze the cover crops as a method of integrating livestock and organic cropping systems. Soil samples were collected prior to planting cover crops in September 2015. Soil available phosphorus (P) ranged from 5.8 to 46.4 mg P kg⁻¹ (Bray-1 P test). The high P levels could be reflective of long-term manure deposits from cattle grazing. At the WCROC in Morris, MN, dairy bull calves (n = 30) were born between spring 2015. Pre-weaning group performance ratings consisted of: weaning weight (219 lb) and average gain per day (1.76 lb/d). At Rodale, over the 150 grazing days of 2015, there was no difference in the rate of gain on the two pastures, and the organic Jersey steers gained an average of 251 lb. Twenty-one fecal samples and 17 feed samples were collected for food safety analysis. E. coli O157:H7 was found in one fecal sample from Rodale (4.76% prevalence rate) and two feed samples from Rodale (11.7% prevalence rate). There was only one sample positive for Salmonella in feed sample from Rodale (5.89% prevalence rate) and no fecal samples positive for Salmonella from the University of Minnesota or Rodale Institute (0% prevalence rate). Our prevalence rates are below previous reports from organically raised cattle in the United States. In the spring of 2016, the steers will graze the wheat and rye cover crops that were planted during the fall of 2015.

Objective
The objective of this study is to evaluate an organic system which integrates crops and livestock and emphasizes a holistic approach by using crop rotations that include legume and grass forages for animal production, soil building, and pest cycle disruption.

Table 1. BW growth by breed

<table>
<thead>
<tr>
<th>Breed</th>
<th>Weaning weight, lb</th>
<th>Pre-wean ADG, lb/d</th>
<th>Post-wean ADG, lb/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>HO</td>
<td>201.7</td>
<td>1.63</td>
<td>2.53</td>
</tr>
<tr>
<td>HMS</td>
<td>228.6</td>
<td>1.85</td>
<td>2.61</td>
</tr>
<tr>
<td>JSN</td>
<td>226.2</td>
<td>1.80</td>
<td>2.25</td>
</tr>
</tbody>
</table>

Preliminary Results
Breeds
1. HO (n=10)  
   - Holstein
2. HMS (n=10)  
   - HO, Montbéliarde, and Swedish Red
3. JSN (n=10)  
   - Jersey, Swedish Red, and Normande

Integrating crops and livestock in a systems approach to enhance organic farm stability, safety, and resilience
Hannah Phillips¹, Bradley Heins¹, Paulo Pagliari², Kathleen Delate³, Bob Turnbull³, Angela Shaw³, Jeff Moyer⁴, and Kristine Nichols⁴
¹ University of Minnesota, West Central Research and Outreach Center, Morris, MN, ² University of Minnesota, Southwest Research and Outreach Center, Lamberton, MN, ³ Iowa State University, Ames, IA, ⁴ Rodale Institute, Kutztown, PA

Material and Methods
Experimental design
- Organic crossbred dairy steers, n=30
- 180 days grazing
  1. Winter wheat (3 reps), n=5
  2. Rye (3 reps), n=5

Data collection during grazing
- BW, hip height, and BCS bi-weekly
- DMI weekly
- Forage samples each time move paddocks
- Forage microbial analysis weekly (1 mo before harvest)
- Forage density at start and end of grazing

Data collection during slaughter
- Strip loin for Warner-Bratzler shear test, FA analysis, and taste panel
- Fecal microbial analysis

Figure 1. Post-weaning BW growth by breed

Conclusions
- HMS steers seem to grow faster and are predicted to continue their growth pattern throughout the study while grazing cover crops.
- Steers will graze cover crops spring/summer of 2016 and will be harvested fall of 2016.
- Expected conclusions from this research include an assessment of the effect of different crop rotations and integrated systems on animal performance, soil quality indicators, crop yields, pest status, food safety/quality and economic performance.
- This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2014-51300-22541.