

Sustainable Dairy Cropping Systems Designed to Produce Forage, Feed and Fuel

To enhance dairy farm sustainability in Pennsylvania and the Northeastern US we have been evaluating two diverse, six-year no-till crop rotations designed to produce all the feed and forage for a typical-sized PA dairy farm. Using farm scale equipment, in each 6-year crop rotation we compared enhanced conservation practices for manure or weed and insect management to typical no-till PA cropping practices. Using the crop yield and quality results of each year and a dairy nutrition computer model, we simulated milk production and compared the whole farm performance of two cropping scenarios. We also included a typical no-till, corn-soy rotation with pre-emptive insect control practices to help assess efficacy of IPM compared to this insurance-based management of insect pests, not to produce feed for the dairy farm.

Based on what we have learned over the past six years, we made some modifications to the diverse rotations and the diverse cropping scenarios have produced the majority of the dairy feed and forage, and were profitable. Manure injection conserved more nutrients, required less inorganic nitrogen fertilizer and maintained similar crop yields. The reduced herbicide practices controlled weeds and maintained crop yield and quality similarly to the standard herbicide system in most crops in most years. Compared to the corn-soy rotation, IPM was successful in maintaining yield while minimizing costs associated with insect pest management.

Having completed 6-years of the rotations, we are evaluating how the enhanced conservation practices have affected soil quality, nutrient dynamics, and weed and insect populations and how the rotations perform in additional years of fluctuating weather, pest, and market dynamics. We will initiate a conservation tillage treatment in the corn-soybean rotation to track soil, nutrient and crop dynamics in comparison to continued no-till; and substitute oats for triticale as an alfalfa companion crop in the pest rotation. To enhance dairy farm sustainability in the Northeast, the following outreach themes will be evaluated on cooperating commercial farms and integrated into outreach programs:

i. managing for whole farm feed production, environmental protection and farm profitability with fall manure applications to double-cropped winter annual forages, ii. Diversifying weed control practices for herbicide-resistant weeds, iii. The use of IPM and conservation of insect biodiversity to control pests, and iv. Conservation practices for soil quality and cropping system performance.

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Project webpage:

<http://plantscience.psu.edu/research/areas/crop-ecology-and-management/cropping-systems>

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2016 NESARE Dairy Cropping System Schematic:

