Cropping Systems Techniques for Adaptation to and Mitigation of Climate Change and Social Changes over Space and Time

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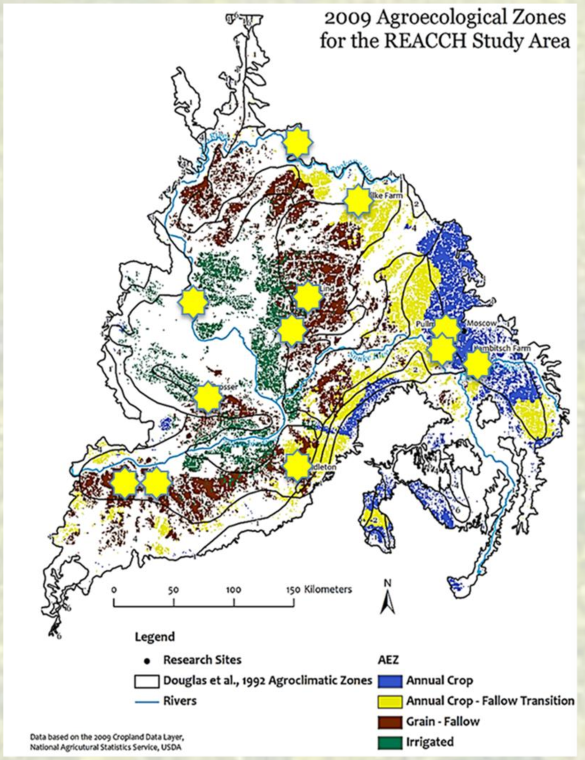
Introduction Agronomic mitigation and adaptation strategies are crop intensification and diversification (Burney et al., 2009), reduced tillage (Stockle et al., 2011), decision support based N and water use efficiency (Pan et al., 2006; Huggins et al., 2010), and integration of recyclable C and N soil amendments (Cogger et al., 2006). Experiment station and on-farm sites have been identified that represent the spectrum of wheat-based cropping systems across five AEZs (map below). At each location, alternative management strategies are being evaluated relative to the standard system by monitoring and measuring soil, crop, and atmospheric properties of small plot and field scale studies.



Objective: Assess cropping systems potential for climate change mitigation and adaptation.

a. Determine and project the effects of current and potential alternative cropping systems and innovative technologies on carbon, nitrogen, water, and energy budgets

b. Improve system productivity and sustainability.

c. Compare management strategies for greenhouse gas reduction potential.

Approach: Use cropping systems experiments throughout the major AEZs to compare standard cropping systems with alternative strategies.

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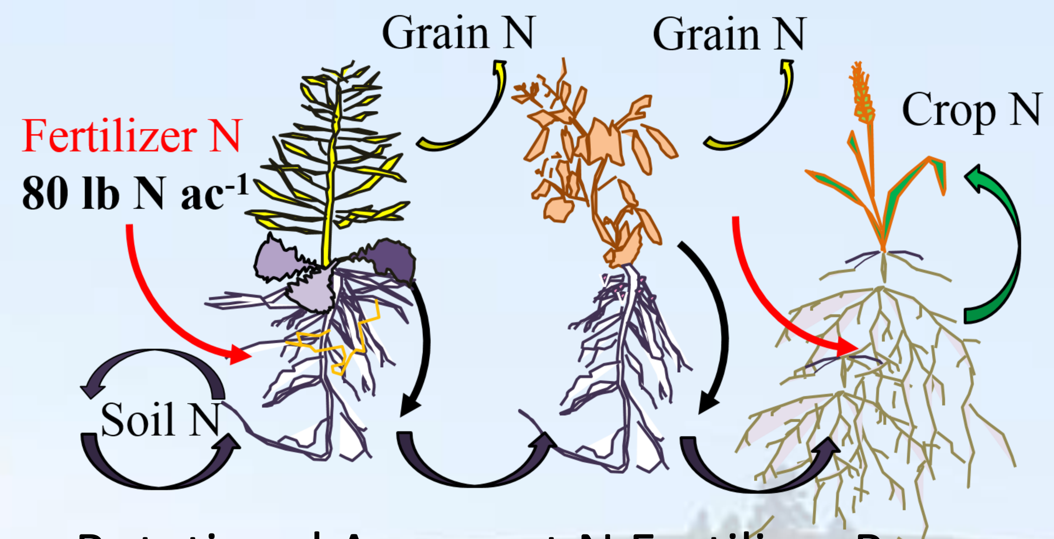
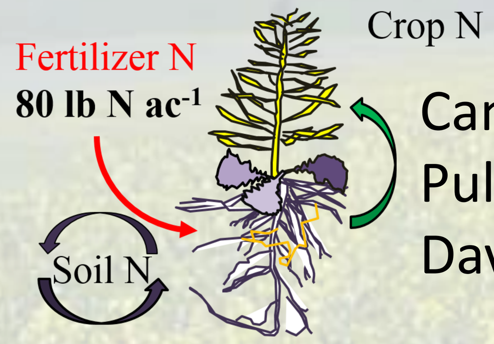
Nitrogen Management



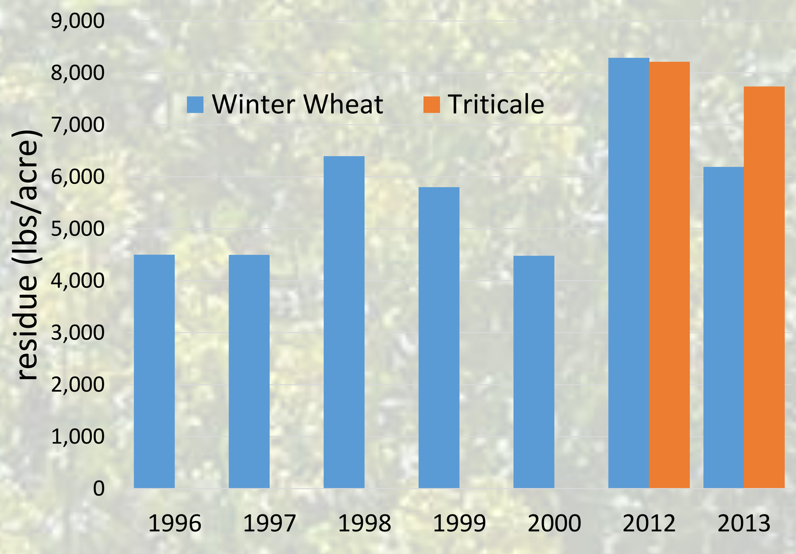
Rotational Apparent N Fertilizer Recovery
Pullman, WA = 53%, Davenport, WA = 32%



Canola Apparent N Fertilizer Recovery
Pullman, WA = 38%
Davenport, WA = 15%

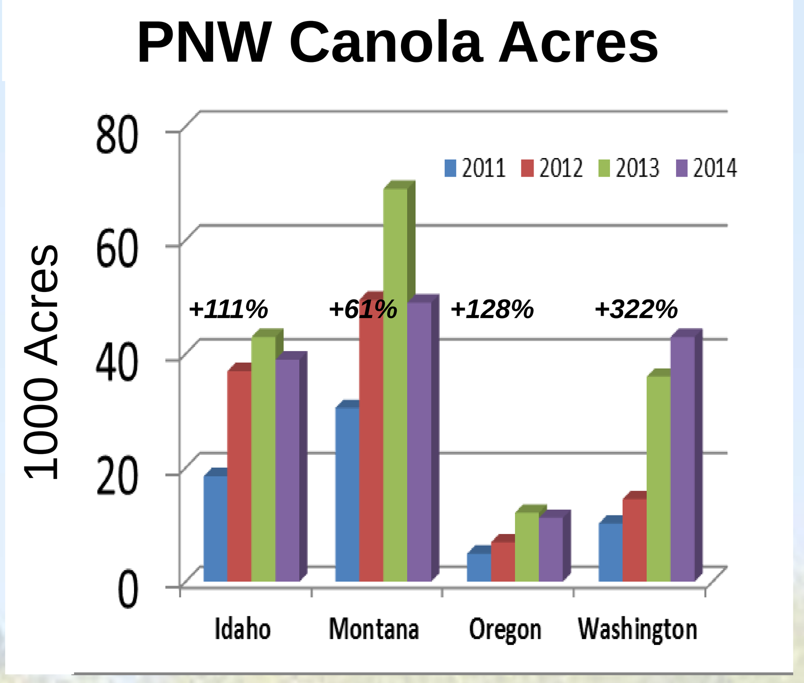
Nitrogen cycle research at two sites has culminated in apparent N fertilizer recovery values for a canola, pea, winter wheat rotation, and a single canola crop, at two cropping systems sites.

Tillage, Residue Management



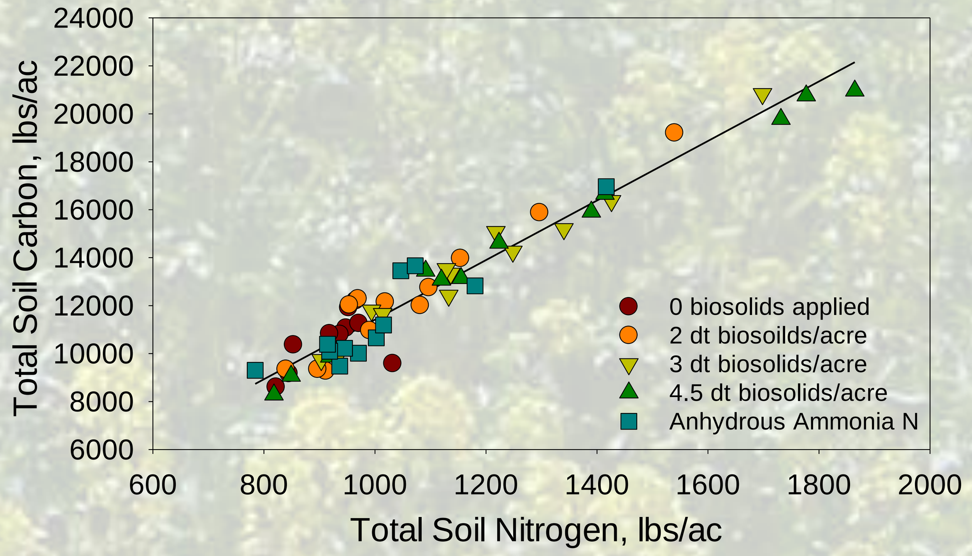
At Ralston, residue production has been increased by growing winter triticale and a tall variety of winter wheat, and that residue maintained with no till fallow. We have successfully planted both cereals and oilseeds into the heavy residue, and yield from the 2014 harvest shows no significant difference in till vs. no till. Carbon accounting is scheduled for spring 2016.

Crop Intensification & Diversification



Canola and peas are being used to diversify rotations in cropping systems projects. Canola acreage in the iPNW has increased by 322% since 2011, and our research has focused on how to best integrate canola in a rotation and what its rotational benefits are. Winter and spring pea are being explored in the low-rainfall zone to determine if they are viable new crops for area growers.

Recycled Carbon and Nitrogen



50,000 tons/per year of WA biosolids are available for application to dryland wheat, enough to cover 16,100 acres 1 app of 3.1 T/A. Based on biosolids with a carbon content of 33% and a soil retention rate of 77%, 1863 lbs CO_2e are stored in soil carbon for each ton of biosolids applied. Carbon storage only occurs when soil nitrogen levels are increased—the graph above shows that 12.4 lbs of C are stored for each pound of soil N.

REACCH is funded through Award #2011-68002-30191from USDA National Institute of Food and Agriculture