PROGRESS REPORT: ORGANIC FARMING RESEARCH FOR THE NORTHWEST

TITLE: Growing nitrogen in the organic orchard

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ABSTRACT (Maximum of 250 words in length, written in non-scientist/layperson language, briefly summarizes your work to date):

OBJECTIVES:
1. Field test four legume species for potential to provide N when grown in the orchard drive alley.
2. Compare cover crop seeding method using a no-till drill with and without a pre-plant burndown.

PROCEDURES:
1. The field trial was successfully established in May 2008 at Warren Morgan Orchards in Quincy, WA. Four different perennial legumes (alfalfa, birdsfoot trefoil, ladino clover, kura clover) were direct seeded in a four-foot wide strip in the middle of the drive alleys. Full length rows were planted. A normal grass cover crop control was included as a fifth treatment. The design is a randomized complete block with four replicates. Mow and blow operations were conducted on May 6, June 14, July 19, August 24, and September 24, 2010.

Percent cover in the alley was determined four times using the point intersect method to separate cover crop, weeds, and bare ground. A biomass sample of each cover crop was collected just prior to each mowing, dried, weighed, and will be analyzed for total N. Mowing was done as a 'mow and blow' system to deliver the biomass to the tree row. Beginning on May 11, soil samples were collected bi-weekly from the top foot of soil for NO_3-N analysis. At the same time, Plant Root Simulator (PRS) probes were placed in the tree row to measure N mineralization for two-week periods consistent with the soil sampling intervals. Soil nitrogen status was evaluated with an early season and post harvest sample (3-ft depth, in 1-ft increments) for available N. Samples have been collected but analysis is not yet complete. In addition, a 3-week mineralization study was initiated on July 13 in the tree row of alfalfa and grass plots. A 4" dia. ABC pipe was pushed 8" deep in the soil. A cutting of the alfalfa, equivalent to the area

of the tube, was placed in the tube, and the tube capped to prevent leaching. A companion tube with no cover crop was also included, and a similar tube placed in grass plots. A weekly soil sample (0-6" depth) was extracted from inside each tube, starting on day 0. Samples will be analyzed for nitrate-N.

Tree nitrogen status was monitored with a leaf sample for total N collected on July 28. Tissue samples will be analyzed using dry combustion.

2. Pre-plant burndown effect. Percent cover in the alley was determined four times using the point intersect method to separate cover crop, grass, weeds, and bare ground, comparing areas with and without pre-plant burndown in 2008 to determine how the effect changes over time.

PROGRESS TOWARDS OBJECTIVES (Comparison of actual results with the original goals):

1. Field test four legume species.
All four legumes had similar % ground cover during the growing season, ranging from 55-80% (except the lower levels in April) (Fig. xx). Weeds peaked in mid-July, with generally no significant differences in weediness among legume species. This confirmed the visually apparent increase in the kura clover stand, which has increased each year since planting (Fig. 1). In contrast, the ladino clover exhibited a decline in Year 3 compared to its excellent stands the prior years.

Cover crop biomass dry matter from five mowing in 2010 (Fig. 2) generally exceeded levels produced by the four mowing in 2009. Ladino biomass was significantly lower than grass or trefoil, confirming its diminished stand. When looking at biomass by species across the

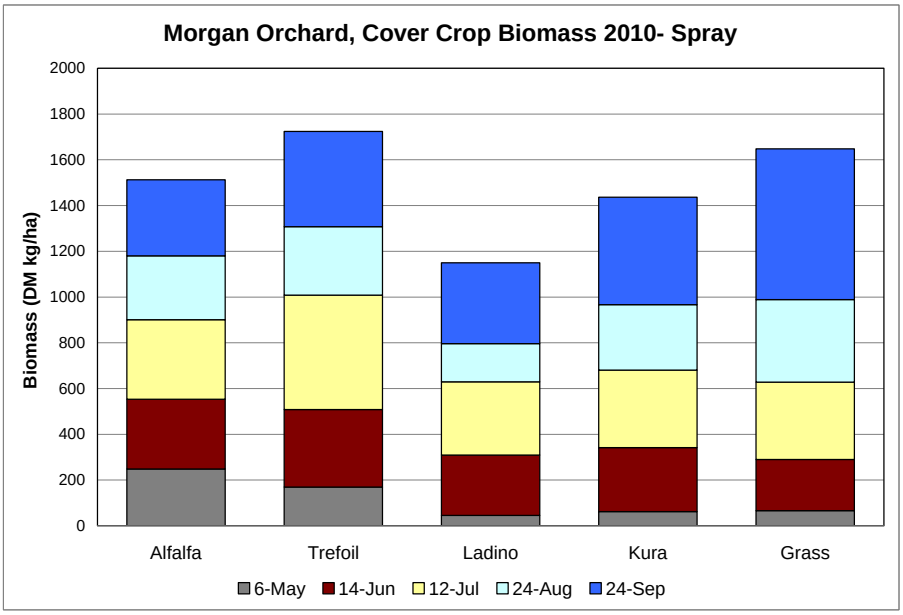

Figure 2. Cover crop biomass (dry matter) by species and mowing date, 2010.

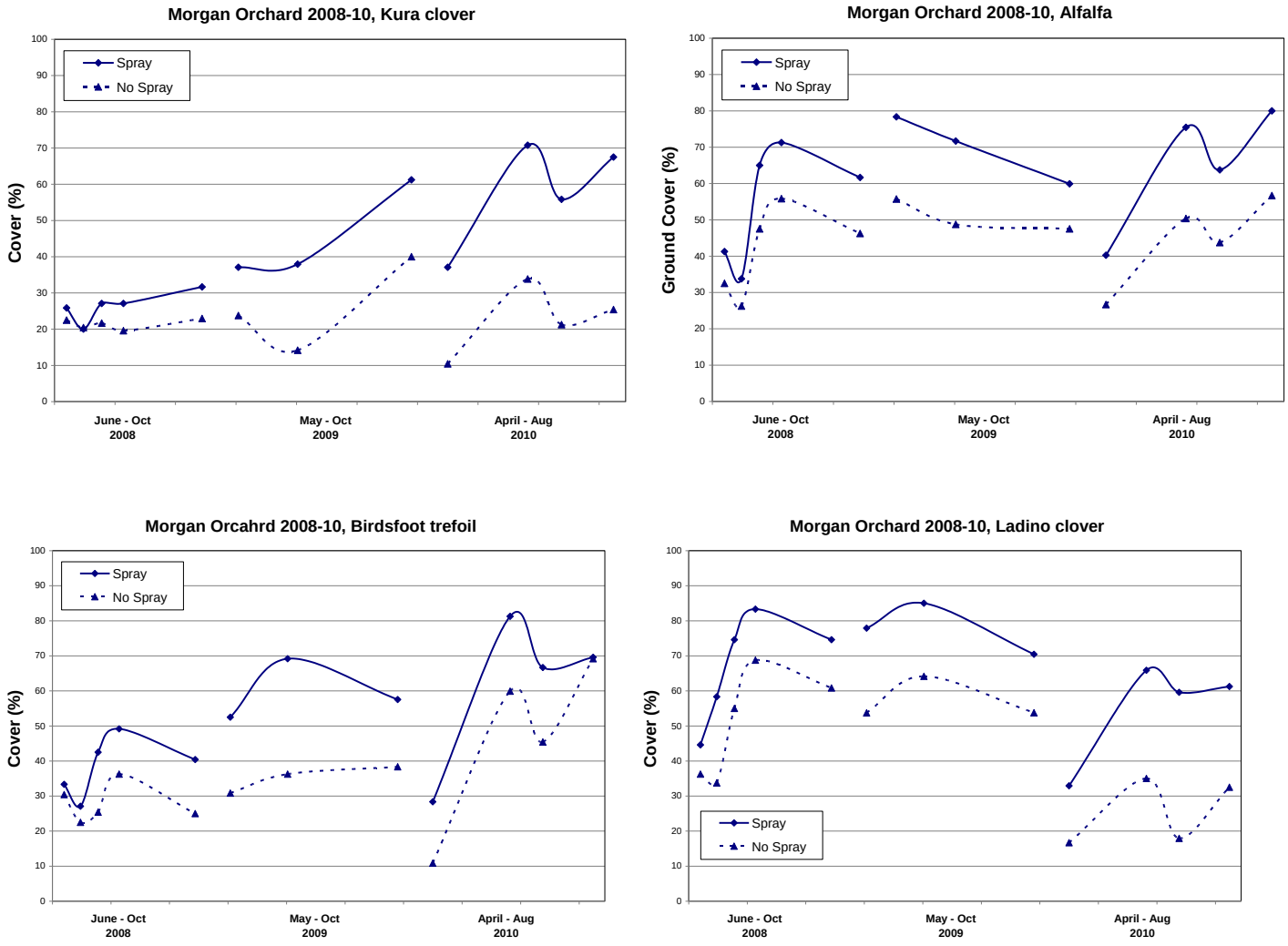

Figure 1. Percent cover of legume species in drive alley from 2008 (planting) through 2010.

three years of the trial, Year 3 stands out as the most productive (Figure 3). For 2010, potential N contribution from the cover crops (estimating dry matter at 3% N for legumes and 2% N for grass) ranged from a low of 35 kg N/ha for ladino clover to a high of 52 kg N/ha for trefoil, with grass at 33 kg N/ha.

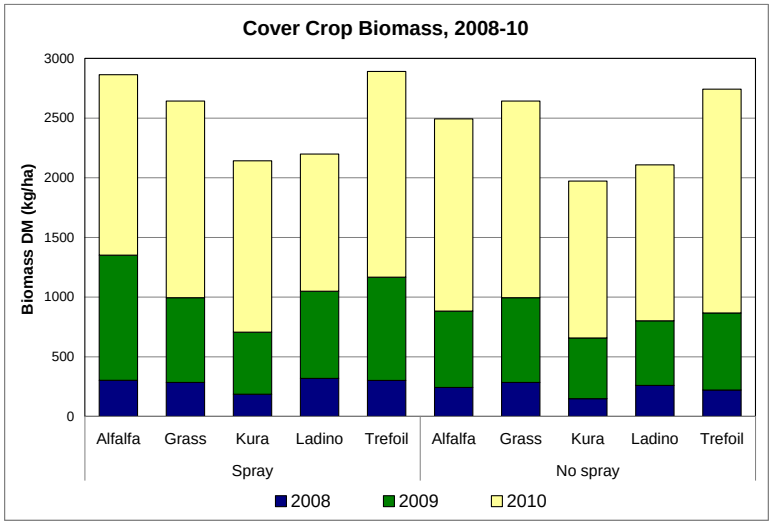

Figure 3. Cumulative biomass dry matter over three years, with and without herbicide suppression (spray vs. no spray) at planting.

Measurements of soil and tissue samples are ongoing.

A wider strip planted to legumes would increase the nitrogen contribution measurably. Ability of the legume species to persist under the wheel tracks is being visually monitored. Legume species bred for pasture may perform better in this respect than the hay types we used (S. Fransen, pers. comm.).

2. Pre-plant burndown effect.

The benefit of pre-plant vegetation suppression in the drive alley was evident again in 2010. Without suppression (no spray), grass increased as a percent of the stand while legume decreased (Fig. 4). Kura clover and ladino clover with no spray were much weedier in mid-July.

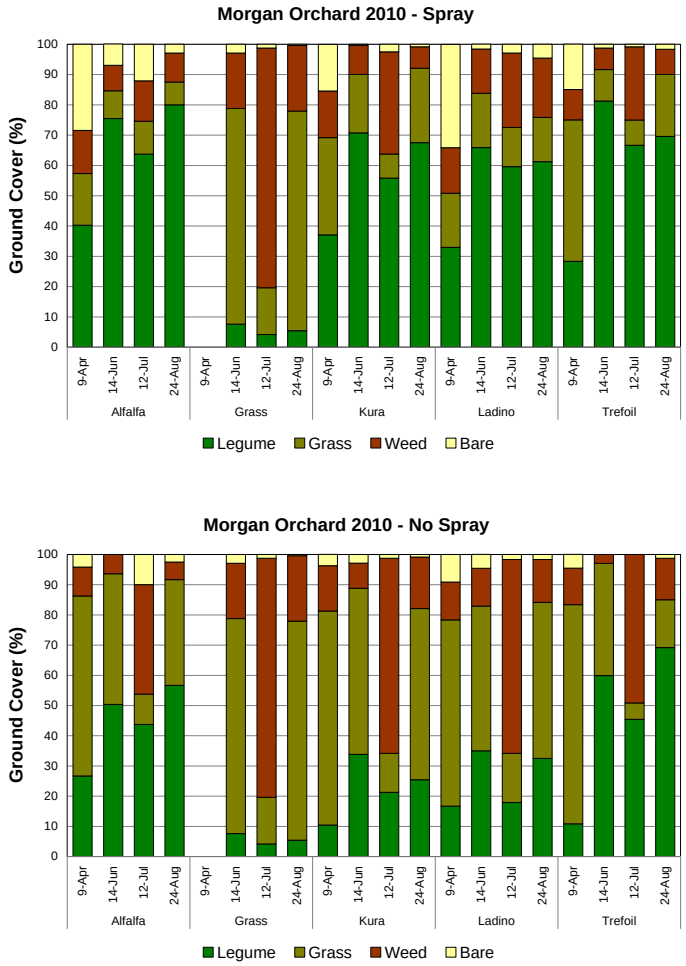

Figure 4. Percent ground cover in drive alley for different legume cover crops, with and without pre-plant herbicide suppression (spray vs. no spray). 2010.

There were no significant differences in cover crop biomass between Spray and No Spray treatments in 2010 (Fig. 5). This was also true for totals for 2009 and 2008. When biomass for all three years was summed, only in one instance, for ladino clover, was there a significant difference between the two pre-plant treatments. These results suggest that a legume intercrop can be successfully direct seeded into an established orchard alley sod crop, and while biomass dry matter will not differ with a pre-plant herbicide suppression, the proportion of legume in that biomass will be higher and thus deliver more total N to the tree row during the mow and blow management.

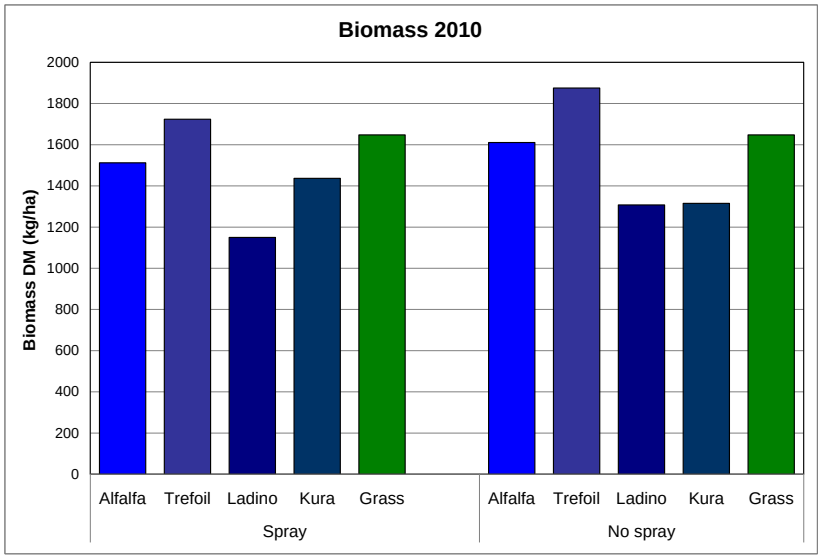

Figure 5. Cover crop biomass from alley in 2010.

OUTPUTS (Publications including newsletter articles, workshops and meetings, presentations, web sites or pages, field days):
Field visits were held for NRCS and Conservation District personnel, fruit company staff, visiting growers, and the CSANR advisory committee. Results were presented at a number of grower and industry meetings, including the Mid-Atlantic Fruit and Vegetable Conference, the Utah Horticulture Assoc. annual meeting, the Michigan IPM think tank, GS Long organic meeting, Wilbur-Ellis organic meeting, Northwest Wholesale organic meeting, and Washington Tilth annual conference.

IMPACT (In what way has your work influenced organic agricultural practices, economics/marketing and environmental stewardship):
Warren Morgan Orchards planted over 40 acres of orchard with legume cover crops using their direct seed drill. In one block, they used ladino clover on half and alfalfa on the other half, with no pre-plant herbicide. Establishment was excellent. Several other growers have borrowed the drill to plant legume cover crops in their alleys. USDA-NRCS is now cost-sharing the planting of legume cover crops in orchards as part of the EQIP program, and has used results from this project for their standards.

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STATE: Washington

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