

WSARE Project FW09-328 Appendix 1

Methods (detail)

North Willamette Research & Extension Center Experiments (NWREC)

At NWREC, the soil is a Willamette silt loam. The main plots were 18' x 70' split three times. The PV cover crop was replaced with a compost treatment (C). In 2010 about 36 tons/ac (as-is weight) was applied, supplying about 11 lbs N/ton and about 400 lbs total N/ac. In 2010 about 27 tons/ac was applied, supplying about 300 lbs total N/ac. No cover crop was planted in the composted plots. All main plots were split with a zero N (0N), 50 lbs/ac PAN (50N) and 100 lbs/ac PAN (100N). 510 lbs/ac feather meal provided approximately 66 lbs/ac total N and 50 lbs/ac PAN as determined by the OSU Organic Fertilizer Calculator. The 100 lbs/ac PAN treatment was the same as in on-farm experiments. The cash crop was popcorn in 2010 and sweet corn in 2011. In 2009 the cover crops established well. In 2010 they were relay seeded into the popcorn and did not establish well due to competition from the popcorn and the popcorn lodged in fall rains. The cover crop was reseeded in February and left to accumulate biomass until June.

Cover Crop Measurements

Cover crop biomass and N content were measured with four 4'x4' quadrat samples of above-ground biomass. Biomass (lbs dry weight/ac) was calculated and a representative subsample was submitted to a soils lab and analyzed for total percent N using a LECO analyzer. Mineralization models in the OSU Organic Fertilizer & Cover Crop Calculator were used to predict plant-available N (PAN) released from the cover crop during decomposition. Cover crops from these plots were mineralized in laboratory incubations as part of the related project to validate the PAN model in the calculator.

Soil Measurements

Soil nitrate levels were monitored from 0-12" depth during the vegetable growing season and in 12" increments down to 36" at the end of the season. Soil organic matter content was measured in a commercial soils lab using the "loss on ignition" method. Soil bulk density and water infiltration rates were measured using the NRCS Soil Quality Test Kit methods. Soil bulk density was measured using a 3" diameter cylinder. Soil was extracted to 3" depth within planting beds and on the edge of a row of plants. A subsample was dried to determine soil percent dry weight, and bulk density of dry soil was determined in g/cm³. The rate of water infiltration was measured using a 6" diameter single ring infiltrometer. Measurements were taken within the planting bed and on the edge of a crop row. The infiltrometer ring was gently pushed a couple inches into the soil, thin plastic sheeting was laid over the ring and 444ml water (to achieve 1" initial depth) was poured on top of the plastic. The plastic was gently removed from the ring and the time of infiltration was recorded. The test was repeated if soil was well below field capacity. Infiltration was recorded in inches per hour.

Soil N mineralization potential was measured with soil sampled from 0-12" depth. Soil was worked through a ¼" screen and misted with de-ionized water if needed to ensure sufficient moisture content. About 600 g of the moist soil is placed in a ziplock bag that is held open with a drinking straw to maintain aerobic conditions during the incubation period. Gravimetric soil moisture was approximately 22% for sandy loam, 30% for silt loam, and 35% for silty clay loam soils. The samples were buried on the edge of the NWREC experiment within the reach of irrigation water for 28 days. About 100g soil was frozen at the beginning of the incubation period (0 days). All samples (0 and 28 day incubations) were analyzed for ppm nitrate-N, and ppm nitrate-N mineralized per day was recorded. This soil incubation method was also used in a related project to estimate N-mineralization of 25 g cover crop samples. In those trials the difference between soil without cover crop and soil with cover crop was used to estimate N mineralization from the cover crops. In 2010 the results were variable and some incubation bags were saturated, so in 2011 we incubated the soil in plastic crates in a laboratory room with relatively even temperature.

Active Carbon was measured using the potassium permanganate method described in the Cornell Soil Health Assessment Training Manual (Gugino et al. 2009), except that soil was shaken but not centrifuged after the reaction. Soil was sampled at 0-12" depth from the 0N plots, sieved to ¼" mesh, dried and stored for later analysis. A 0.2M potassium permanganate solution is prepared and a standard light absorbance curve is developed using a range of dilutions and a 550 nm colorimeter. Soil is sieved with 2mm mesh and all organic residue is removed. 2.5 g soil is put in 18 ml of de-ionized (DI) water. 2ml potassium permanganate solution is added and the sample is shaken at 120 rpm for 2 minutes, then the samples rest for an additional 8 minutes. The supernatant is diluted with 49.5 ml DI water, shaken for 10 seconds, and measured for light absorbance. The potassium permanganate changes color from deep purple to light pink or clear as it oxidizes increasing amounts of labile C in the soil.

Vegetable Crop Measurements

Yield estimates were made when treatment differences were apparent, this occurred when soil nitrate-N levels were below about 10-20 ppm in fallow and/or unfertilized plots. 10 row feet are sampled. In root crops (i.e. table beets) the roots are harvested, in other crops (i.e. corn), the roots were not harvested. Total fresh weight, marketable fresh weight from the sample area, total count of harvested roots or cobs, and count of marketable roots or cobs is recorded. N uptake was measured in the sweet corn and popcorn grown at NWREC (2010 and 2011). The harvested plant (including roots for root crops) is harvested from 10 row feet, and fresh weight is recorded. A few plants (i.e. 3-4 corn plants) are shredded in a chipper and collected in a mesh bag. The shredded plant is mixed and about 200g is collected and weighed fresh, oven dried, and weighed dry. The dried subsample is analyzed for total percent N at an analytical laboratory, and total N uptake (lbs/ac) is calculated.