Puyallup

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Building on Existing Research

The Puyallup Long-Term Agricultural Research and Extension (LTARE) site is located on certified organic land at the WSU Puyallup Research and Extension Center. The specific site was the location of a different long-term organic farming systems experiment that ran from 2003-2015. The land was maintained as pasture for the intervening years and transitioned to the new experiment during the summer of 2022. As part of the transition, plots were located, tilled, and planted to a summer cover crop of sudangrass in late June 2022.

The experiment focuses on maritime northwest organic fresh vegetable systems. The design of the Puyallup LTARE was strongly influenced by the previous organic farming experiment as well as a different multi-year organic reduced tillage experiment. The design is a split-split plot, randomized complete block with four replications. Main plots include an intensive tillage, reduced tillage, and animal integrated system. To manage residue and prepare beds for planting, the intensive tillage treatment utilizes a rotary spader which tills to approximately 30 cm. The reduced tillage treatment utilizes a no-till transplanter, no-till drill, strip tillage, and a power harrow operated at 2.5-7.5 cm. The animal-integrated treatment also uses the power harrow and strip tillage and additionally reduces tillage over the 3-year rotation by establishing a pasture for 18 months. The experiment utilizes a 3-year crop rotation and subplots are the year of the rotation. Sub-sub plots include compost application where compost is applied at a relatively high rate (20-30 dry tons) once every three years.

Before initiating treatments for the Puyallup LTARE, soil was sampled for baseline physical and chemical parameters. Baseline soil sampling occurred in 72 plots at four different depths (0-15 cm, 15-30 cm, 30-60 cm, and 60-90 cm). Analyses at the 0-15 cm and 15-30 cm included bulk density, weed seed bank, phospholipid fatty acid, total C and N, pH, texture, autoclavable extractable protein, POX Carbon, fertility (pH, EC, CEC, NO3-N, NH4-N, P, OM, Ca, Mg, K, Na, Zn, Mn, Cu, Fe). Analyses at the 30-60 cm and 60-90 cm included total C and N, pH, and texture.

Strip tillage, pictured below, is being used at the Puyallup LTARE site.

A cover crop at the Puyallup Research and Extension Center.

Additionally, at the 0-15 cm depth, soil microbiome was sampled.

Overcoming Challenges

In fall 2022 treatments for the LTARE were initiated by preparing soil with a spader (full till treatment), with just mowing (reduced till treatment) and with the power harrow (animal integrated). Following ground preparation, either cover crop, winter wheat, or pasture were planted. No irrigation was used for the cover crops and a lack of substantial fall rain resulted in poor crop stands. In spring 2023, we mowed all plots to reduce weed growth. Surprisingly, the winter wheat and cover crops rebounded well, and substantial biomass accumulated. Cover crop biomass was sampled prior to termination. Often, fall rains are sufficient to establish over-wintering cover crops. In the future, we irrigate cover crops.

The major cropping systems activity in spring and early summer of 2023 was to establish winter squash. Squash plots were prepared with a spader (intensive tillage) mowing and strip tilling (reduced tillage) and mowing, power harrow, and strip tillage (animal-integrated). Plots were fertilized with a feathermeal fertilizer and squash was transplanted on June 15th, 2023. Drip irrigation was setup and plants are progressing well and looking healthy. In the other years of the rotation (sub-plots) winter wheat (intensive and reduced tillage) and pasture (animal-integrated) continue to grow and a summer cover crop (intensive and reduced tillage) will be established after compost is applied to half of those plots. Mid-July soil

Cover crop field day attendees learning about a compact super seeder.