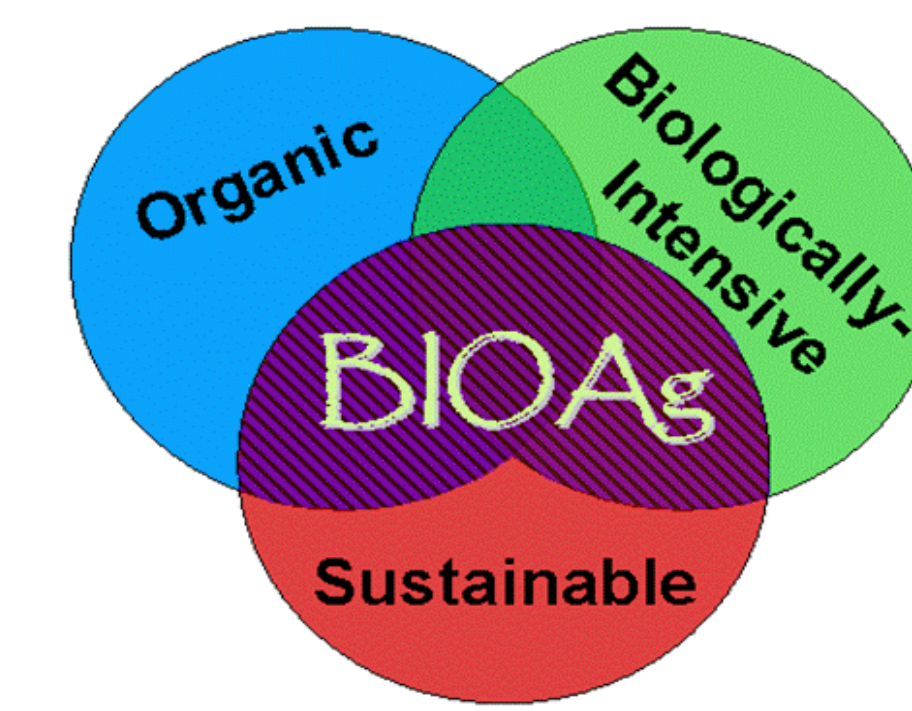


Organic Conservation Tillage Practices – Innovations and Implications for Grain, Vegetable, and Conventional Farming Systems

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Tillage: Intensive tillage is a proven, but often unsustainable, strategy for organic weed management. It is essential that we develop alternative conservation and no-till alternatives. WSU and USDA-ARS projects are evaluating organic cropping systems that do not include inversion tillage, chisel plowing, or disking. Under rain fed irrigated conditions in W. Washington, a no-till system using the roller-crimper is being evaluated. Under high rainfall dryland (21”) conditions near Pullman, two long-term cropping systems studies are utilizing the undercutter sweep and rotary harrow (pre-plant, post-harvest), as well as rotary hoe (in-crop). An experimental inter-row cultivator with precision guidance will be evaluated in various crops in 2010. Mowing (not shown) can sometimes proved supplemental weed control. A tined weeder has potential in low residue situations but has not been evaluated. Rapid establishment of competitive crops is an essential complement to these practices. This research has implications for conventional farming as well, since these practices are applicable for suppression of weeds, including herbicide resistant weeds, while conserving soil resources.



Roller-Crimper (above)

The roller crimper is a no-till approach to conserving soil quality while managing weeds and is most applicable to higher rainfall and irrigated conditions. An on-farm study was conducted in W. Washington in 2009. A winter rye cover crop was roller-crimped twice (upper photo) in spring followed by transplanting pumpkins (lower photo). The organic no-till system, compared to the conventional till system used only 34% of the diesel fuel, with yields being reduced approximately 10% and no change in average pumpkin size. Weed control was very good early in the season in the organic no-till system, but transplant shock and slow canopy establishment led to weed problems. Improved transplant procedures should improve upon this.



Inter-row cultivator (prototype, above)

An inter-row cultivator with precision guidance is being developed for dryland conditions for weed suppression. This prototype, with 15” row spacing, will have coulters ahead of the low-disturbance sweeps. Initial row spacing is 7.5” to maximize initial weed competition, and the cultivator will eliminate alternate rows. We are testing this in winter wheat monoculture, alternate-row winter wheat/winter pea intercropping, and in spring crops.



Undercut cover crop after sweep (organic treatment)



Undercutter-Sweep (above)

The undercutter-sweep (photos above) is unquestionably an essential tool for conservation tillage in dryland organic weed management is being used in conventional systems as well. It can be utilized for pre-plant and post-harvest weed management and may aid with suppressing perennial weeds. Coulters (not shown) cut through residue ahead of the sweep.



Rotary Harrow (above)

The rotary harrow has been used as a pre-plant weed management and seedbed preparation tool, and can also improve weed control when used following the undercutter. Residue and weeds are lifted up and dropped back on the surface. The lower photo shows wheat residue following two passes.



High Residue Rotary Hoe (above)

The high-residue rotary hoe can be utilized in-crop in dryland conditions for control of small seedling weeds. Crops such as wheat and winter peas tolerate rotary hoe treatment up to about 12” height. Multiple passes at approximately 10-day intervals provide good control of most weeds, but wild oat control was inadequate. Intensity can be increased by adding weight to the implement. Weed control is best when soil is moist followed by drying conditions.

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