

## **STRIP PLANTING COVER CROPS TO IMPROVE CROP GROWTH IN REDUCED TILLAGE SYSTEMS**

Anusuya Rangarajan, Senior Extension Associate  
Dept. of Horticulture  
Cornell University  
Ithaca, NY 14853

Benefits of tillage include increased nutrient mineralization from incorporated crop residues and weed control. However, interest in reduced tillage methods is expanding in response to concerns for soil quality and environmental health. Reduced tillage refers to systems that minimize soil disturbance and maintain at least 30% residue cover. These tillage systems can reduce soil and wind erosion, overcome compaction challenges typical of vegetable soils, conserve organic matter and improve overall soil health. In addition, research with conventional vegetable growers has demonstrated a reduction in fuel use and equipment wear as well as an improvement in labor efficiency. Deep zone tillage is one reduced tillage (RT) method that minimizes the width of soil disturbance to the planting row while providing sufficient soil disturbance to increase drainage and aeration and decrease compaction. This disturbance results in improved conditions for seed germination compared to no-tillage systems which may not be feasible in the finer soils of the Northeast due to cooler soil temperatures and high moisture.

Cover crops are another important tool to enhance soil health; they have been shown to reduce soil erosion, promote better nutrient cycling, improve soil physical properties, improve soil fertility and suppress weeds. As such, integration of cover crops in a reduced tillage system serves to further improve the whole system's ability to build soil quality and accrue environmental benefits. The organic matter from decaying cover crop residue can help improve the ability of plant roots to penetrate the soil when tillage is avoided. Winter cover crop root system decay over the summer crop season creates biopores that allow movement of air and water, leading to easier vegetable root penetration in a compacted sandy loam.

Cover cropping practices may be employed to enhance the performance of reduced tillage techniques and improve soil health. Cover crops in reduced tillage systems can provide a surface mulch that is not present in conventionally tilled fields. This mulch helps to conserve water, suppress weeds, and protect the soil from washout due to pounding rains or wind. Cover crop mulch (especially cereal-legume mixtures) has been found to be effective for in-row weed suppression. Efficacy of weed suppression is affected by the quantity of mulch, as determined by seeding rate and planting date. If insufficient mulch is applied, weed emergence can be stimulated by trapped moisture three times the amount that can be grown in a specific area is applied.

Additionally, legume cover crops are invaluable for their nitrogen contributions. In cover crop mixtures, leguminous cover crops fix nitrogen while non-leguminous cover crops scavenge nitrogen, resulting in reduced leaching. Hairy Vetch is thought to increase vegetable yields by adding mineralizable N to the soil and improving soil structure through root and biomass growth. Rye-vetch mixtures can reduce leaching prior to crop N-assimilation and produce higher biomass

yields than either cover crop grown alone. Both cover crops are winter-hardy and can be killed effectively in an organic system with flail mowing if done at the heading stage.

Alternating strips of winter-killed cover crops for seeding areas with winter-hardy covers, like rye, for between-row areas may provide a useful innovation for RT, since minimal residue in the seeding areas avoids problems of soil-seed contact in-row while maintaining a weed suppressing mulch between-row. This method requires a no-till drill with a divided seed box or a seeder with multiple seed boxes (e.g. Planet Jrs) arranged for planting in strips of specific cover crop seed of different sizes or rates. Alternating strips of grasses and legumes may also provide a number of other potential benefits compared to cover crop monocultures including potential improvements in resource capture, weed suppression, efficiency of biological N-fixation and synchronization of N supply and crop N demand.

From 2011-2012 we evaluated strip planting strategies of winter-killed with overwintering cover crops to improve weed management and crop yields in both organic and conventional reduced tillage systems. Our results from 2011 showed that in organic production, the strip planted cover crops that performed the best (statistically significant) were the oats/peas mix sown throughout the plot as well as the bare ground control. The two next best performing cover crop treatments were the combinations of oats/peas and rye/vetch (either in row or between planting row). Rye/vetch, sown throughout the plot, performed lowest of all the cover crop treatments. For the conventional strip-planted cover crop trial in 2011 there were no differences amongst treatments. The 2012 organic and conventional strip-planted cover crop trial showed no differences amongst the cover crop treatments. Strip planting of cover crops may be a strategy to allow cover crops to accumulate greater biomass and therefore contribute more soil organic matter in these RT systems.