Organic No-till Tofu Soybean Production at the Hudson Valley Farm Hub, Winter 2015

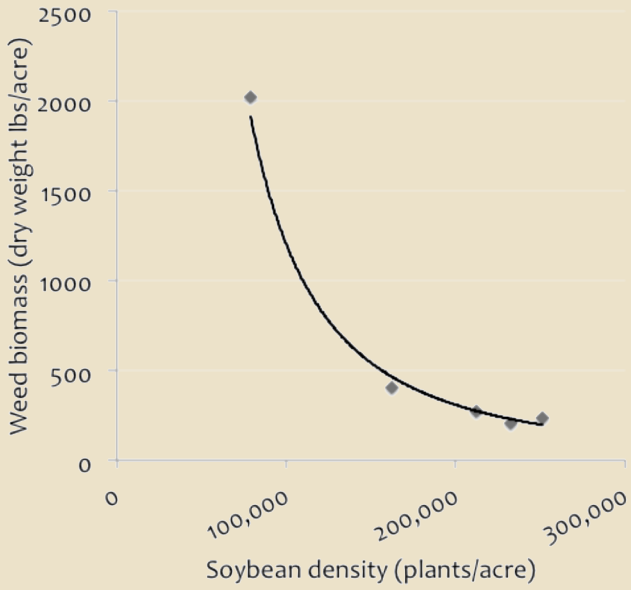
Organic grain crop farmers commonly rely on soil tillage and cultivation for weed management. Tillage also creates a fine seedbed, suppresses diseases and insect pests, and it incorporates manure, compost, and lime. However, farmers are increasingly, and rightfully, concerned about soil erosion and the negative impact that tillage can have on soil health. One alternative is to use mechanically terminated cover crops as mulch to suppress weeds in no-till planted grain crops. This approach protects the soil, and has potential to reduce labor and fuel costs.

Unlike mechanical weed management, using cover crop residue as mulch moderates soil temperature, conserves soil moisture, and creates a favorable environment for beneficial organisms. Mulch can effectively suppress annual weeds that germinate from seed, but perennial weeds such as canada thistle, hedge bindweed, and yellow nutsedge can be harder to control. Rotational no-till, where tillage is used for the cover crop, but not for the grain crop, can be used to overcome the perennial weed problem. A substantial reduction in soil disturbance and in the number of field operations can be achieved with rotational no-till because secondary cultivation such as tine weeding, rotary hoeing, and inter-row cultivation is eliminated. Typically the cover crop is seeded in the fall into a clean seedbed that is prepared with tillage. The cover crop overwinters and grows rapidly in the spring before it is mechanically terminated with a roller-crimper (left). Different grain and cover crops can be combined as part of a cover crop-based, rotational no-till system, but so far organic soybean no-till planted in rolled-crimped cereal rye or triticale has been the only combination that has consistently performed well (right).

Previous research shows that planting rate recommendations based on conventional soybean production with herbicide resistant varieties are inappropriate for organic systems, and that organic farmers can realize greater yields and profits with higher soybean planting rates. In 2014, we conducted a field experiment at the Hudson Valley Farm Hub to 1) quantify the relationship between planting density and weed suppression, and 2) identify the economically optimum planting rate in organic no-till planted tofu soybean.

Organic soybeans ('IA2053' food grade, group 2.1 maturity) were no-till planted into rolledcrimped triticale at 5 rates ranging from 8o,ooo to 370,000 seeds/a on June 10 at the Farm Hub (upper). Soybean performance and weed suppression were evaluated on August 29 (lower).

Weed biomass decreased as soybean density increased (left). At higher densities, soybean plants helped to shade weeds that broke through the cover crop mulch. Soybean plants can lodge when planted at high rates, but we did not observe any lodging. Soybean yield data, seed costs, and grain prices are now being analyzed to determine the economically optimum planting density. Although previous data from Pennsylvania and Maryland suggest high planting rates can increase yield, data from a different site in New York in 2014 showed no yield advantage. Complete results from our economic analysis of organic no-till tofu soybean planting rates will be available in early spring.



Project team: Jeff Liebert, Brian Caldwell, Justin O'Dea, Chris Pelzer, and Matthew Ryan (mryan@corneH.edu) from Cornell University and John Gill from the The Hudson Valley Farm Hub.

By Matthew Ryan, Cornell University Agroecologist