Conservation Tillage Tomato Production at Sano Farm
Firebaugh, CA
Alan Sano and Jesse Sanchez

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Introduction

During the past six years, Sano Farm in Firebaugh, CA has refined a production system for processing tomatoes that uses cover crops, subsurface drip irrigation, and conservation tillage practices. The overall system that Alan Sano, the co-owner of Sano Farm, and Jesse Sanchez, the farm's manager, developed saves fuel by reducing the number of tractor operations that are used during the year, cuts fertilizer inputs, reduces labor and production costs, improves soil condition, reduces overall risk, and has increased tomato yields by 12 – 15% relative to the standard practices that were previously used. Considerable planning was required to successfully manage the integrated production system used at Sano Farm. This planning involved developing suitable cover crop species and seeding formulations, timing and management of the cover crop, strip-tillage equipment and precision fertility and weed management. The following description summarizes how the Sano Farm tomato production systems work.

Sano Farm is a 4000-acre farm in the Westlands Water District of Western Fresno County. In past years, it produced a variety of crops including cotton, melons and tomatoes, however, during about the past four years, it exclusively produces processing tomatoes on its annual cropland.

Winter Cover Crops

An important component of the integrated tomato production system at Sano Farm is the use of winter, small grain cover crops. These cover crops are typically seeded in late October or early November, irrigated up as part of the farm's "pre-irrigation" program for the following year's crop, and then terminated with herbicide some time typically in early February before the aboveground growth is too unwieldy and difficult to manage. These cover crops, which for a number of years consisted of a single species of triticale, recently were switched to barley, are seeded at a rate of about 110 lbs per acre. Sano Farms

experimented with various seeding rates as low as 45 lbs per acre, but are currently using 110 lbs per acre to achieve desired cover and growth. The cover crop characteristics that Sano Farm now seeks include high amounts of root biomass, quick surface cover with minimal initial irrigation, and quick melt-down following herbicide application to allow ease of transplanting. Photo 1 shows the 25-ft Great Plains® drill they use for seeding. The drill was modified to plant only the bed top and not the furrow (Photo 2).

Typically, the only tillage that Sano Farm employs following the harvest of one tomato crop and preceding the next season's crop planting consists of two tillage passes. The first of these operations involves a furrow chiseling pass to break compacted zones and a second pass employs a Wilcox Agriproducts Performer® (Walnut Grove, CA) bed conditioning implement that is used to shallowly mix residues, loosen the soil in the bed, and shape planting beds for the subsequent season. These tillage passes rely on GPS

Photo 1. The 25-ft Great Plains drill used for seeding winter small grain cover crops at Sano Farm. This modified drill seeds across the bed top, but does not put seed in the furrow.

Photo 2. Great Plains® 25-ft drill seeding winter cover crops with seedlines every 7.5" on 40"-wide tomato bed tops at Sano Farm, Firebaugh, CA

guidance to preserve essentially undisturbed crop growth zones in the centers of beds where long term buried drip tape lies, and thus perform “zone tillage” on permanent tomato planting beds.

The winter small grain cover crop at Sano Farm is typically terminated before it grows more than about 15” tall, which usually is in early February (Photos 3, 4 and 5). The cover crop provides some winter weed control. They observe their cover crop combined with the overall conservation tillage approach that is used at Sano Farm results in lower weed populations in the tomato season.

Photo 3. Winter triticale cover crop growth in early February 2008 at Sano Farm, Firebaugh, CA

Photo 4. Triticale cover crop prior to herbicide termination at Sano Farm, Firebaugh, CA, 2008. This photo shows the height or extent of cover crop biomass achieved at the time of termination.

Photo 5. Herbicide treated triticale cover crop dying or "melting down," Sano Farm, Firebaugh, CA 2007

Photo 6. Herbicide-terminated triticale cover crop at Sano Farm prior to transplanting, 2007

Strip-tillage Prior to Tomato Transplanting

Ahead of transplanting processing tomatoes in the spring, Sano Farm uses a ground-driven strip-till implement to loosen the soil, mix in cover crop residues and incorporate herbicide into the soil in the center of beds where transplants will be established. This strip-till operation shallowly works the soil to a depth of about 8 inches and then leaves a firmed zone of soil into which the transplants will be placed. In prior years, Sano Farm used a PTO-powered rototiller mulcher to accomplish this strip-tillage function, but they now use row units from an Orthman® model 1-tRiPr (Lexington, NE) as shown in Photos 7 and 8. A close-up of these strip-till row units is shown in Photo 9. Photo 10 shows the condition of beds after strip-tilling and before transplanting. Some starter fertilizer is also applied with the strip-tiller ahead of transplanting. The ground driven implement can be operated faster and with less maintenance.

Photo 7. Modified Orthman 1-tRiPr 5-row strip-till implement tilling in cover crop residue and incorporating pre-plant herbicide prior to tomato transplanting at Sano Farm, Firebaugh, CA, 2009

Photo 8. Ground-driven strip-tiller used to prepare bed centers prior to transplanting, Sano Farm, Firebaugh, CA, 2009

Photo 9. Close-up view of modified Orthman 1-tRiPr strip-till row units on Sano Farm strip-tiller showing residue-cutting depth wheel and coulter, subsoiling shank, wavy coulters, and clod-busting rolling baskets.

Photo 10. 60 inch tomato beds after herbicide burn down of cover crop and bed-center strip-tillage prior to tomato transplanting, Sano Farm, Firebaugh, CA 2009

Tomato Transplanting

Tomato transplanting at Sano Farm is done using a conventional 5-row transplanter (Photos 11 and 12). This transplanter requires no modifications and performs well in the minimal surface cover crop residue that is typically present at the time of transplanting.

The Need for "Systems Management"

The integrated production techniques that are now successfully used at Sano Farm, Alan Sano and Jesse Sanchez have been developed through considerable planning as well as very rigorous and detailed trial and error investigations. Both Sano and Sanchez now emphasize management of their entire "system" and not merely a sequential combining of different practices.

They have found, for example, benefits from their cover crops being left in place on the bed tops as a mulch and not being incorporated as green manure in terms of weed control during both the winter and summer and overall soil tilth. Improvements in soil quality such as greater friability and the presence of earthworms have been detected after the system has now been in place for a number of years.

While changes in soil carbon have not been monitored at Sano Farm, based on recent long-term research with conservation tillage and cover crops a the University of California West Side Research and Extension Center in Five Points, CA, it is reasonable to expect that soil carbon levels have increased due to the cover crop inputs at Sano Farm.

Photo 11. Conventional 5-row tomato Checcli Magli® (Hahn Tractor, Stockton, CA) transplanter that is used to establish tomato seedlings in cover crop residues at Sano Farm, Firebaugh, CA 2009

Photo 12. Conventional 5-row tomato transplanter that is used at Sano Farm, Firebaugh, CA, 2009

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