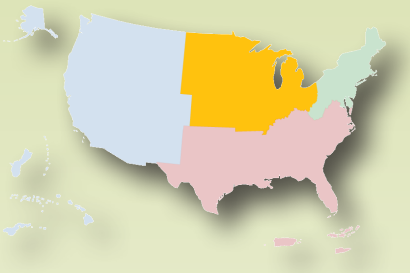
Ag Innovations Series

FARMER & RANCHER INNOVATIONS

Lessons learned from trials and demonstrations conducted primarily by farmers and ranchers



On-Farm Fertigation Trials in Kansas City-Area Organic High Tunnels

Project Summary

Five certified organic farms in the Kansas City area did one-year comparisons of the use of compost, fertigation and foliar feeding on high tunnel tomatoes, with respect to quantity and quality of yields. The farmers agreed to use Celebrity Bush tomatoes for their comparisons, and some involved other vegetables. The fertilization treatments they tested included foliar feeding and fertigation with fish emulsion, and chicken-litter compost. Each farm developed its own comparison, as opposed to a single experiment replicated on all five farms. The farmers involved in this project gained general impressions about the potential usefulness of fertigation and/or foliar feeding, but no conclusive results were derived. They also discovered the difficulty of coordinating a multi-farm project without dedicated, experienced leadership.

The Kansas City area is in USDA Plant Hardiness Zones 5b and 6a.

Top Findings and Lessons Learned

- The farmers experienced mixed results, and generally concluded that any benefit from fertigation and/or foliar feeding of tomatoes was hard to recognize.
- They discovered that coordinating and managing a multi-farm research project was more difficult than anticipated. One of the farmers volunteered to coordinate the project, but they felt they would have been more successful with a dedicated, experienced research coordinator. Due to time constraints and less involvement from Extension personnel than initially anticipated, they had to scale back their initial plan.

SARE FUNDING FOR THIS PROJECT

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FNC05-577

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SARE Region
North Central

Grant Type
Farmer/Rancher

Project Coordinator
Stu Shafer, Sandheron Farm
Oskaloosa, KS
(785) 597-5510
sandheron@wildblue.net

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Written by SARE staff and reviewed by Extension specialists.

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- Fertigation improved yield in two instances. However, the corresponding economic gain barely covered the cost of the inexpensive fertigation equipment.
- In some instances, fertigation led to better quality fruit and earlier production, traits that have the potential to translate into a higher return.
- The effect of foliar feeding was less conclusive than fertigation, and in some cases had a negative impact on yield.

Treatments Compared

The five certified organic, fruit and vegetable farms involved in this project were: Sandheron Farm in Jefferson County, Kan., a newer operation with three to four acres in production; Hoyland Farm, also in Jefferson County, Kan., in operation since 1976 with 69 acres (not all of which is in production); the Kansas City Center for Urban Agriculture's Kansas City Community Farm, which has a two-acre farm and extensive high tunnel experience; Bear Creek Farm in Osceola, Mo., with six to eight acres and extensive high tunnel experience as well; and Woods Mood Gardens in Higginsville, Mo., which produces beef, chickens and eggs as well as produce, and has been operating since 1994.

TABLE 1. TOTAL AND AVERAGE WEIGHT OF YIELDS BY TREATMENT ON EACH FARM[1]

	TOTAL WEIGHT (LB)[2]	AVERAGE WEIGHT (LB)[2]
Hoyland Farm	Whey Fertigation - 48.27	Whey Fertigation - 0.30
	Fish Fertigation - 32.15	Fish Fertigation - 0.27
	Control - 31.72	Control - 0.24
Kansas City Community Farm	Fertigation - 187.7	Both[3] - 0.39
	Control - 163.6	Control - 0.38
	Both[3] - 143.7	Fertigation - 0.34
	Foliar Feeding - 107.2	Foliar Feeding - 0.33
Bear Creek Farm	Both - 95.58	n/a
	Control - 88.14	n/a
	Fertigation - 86.68	n/a
Wood Moods Farm[4]	Fertigation - 128.6	Fertigation - 0.5
	Foliar Feeding - 119.1	Both - 0.49
	Control - 97.5	Foliar Feeding - 0.47
	Both - 97.4	Control - 0.46

[1] Does not include Sandheron Farm, which gathered incomplete data due to a greenhouse accident.
[2] Treatments are listed highest to lowest according to yield.
[3] Both fertigation and foliar feeding.
[4] Data includes No. 1 tomatoes only.

The trials took place in high tunnels in 2007. Farmers applied compost to all their test plots, and included compost-only controls. All treatments and controls had drip irrigation. Each treatment plot had five plants. Each farm's comparison involved:

- Sandheron Farm compared fertigation with fish emulsion and a compost-only control.
- Hoyland Farm established three plots: fertigation with tofu whey waste, fertigation with fish emulsion, and a compost-only control plot.
- The Kansas City Community Farm compared both fertigation and foliar feeding with fish emulsion, and a compost-only control plot.
- Bear Creek Farm compared fertigation with fish emulsion, a combination of fertigation and foliar feeding with fish emulsion, and a compost-only control.
- Woods Mood Gardens, like the Kansas City Community Farm, compared both fertigation and foliar feeding with fish emulsion, and a compost-only control plot.

For fertigation, the farms agreed to use an inexpensive liquid fertilization system from EZ-FLO and Neptune's Harvest fish/seaweed (2-3-1). For compost, they selected Early Bird Chicken Manure compost (3-4-2), and applied it at the rate of 60 pounds per 500 square feet, which provided 156 pounds of N per acre.

Fertigation was started at flowering. Fish emulsion was applied at a rate of 1.4 pounds per row, or 6 pounds of N per acre per week. Tofu whey was tested at 0.074 percent N and the rate of application was 37 pounds per row, or four gallons to apply 6 pounds of N per acre per week.

Farmers established their test plots in two rows inside the high tunnel, making an effort to place them toward the center of the structure, not toward the ends. They split their drip irrigation into two lines and installed fertigation equipment at the head of one line, meaning all fertigation

treatments were in the same row.

Kansas State University horticulture specialists helped the farmers with data collection (harvest quantity and weight).

Results

Overall, the farmers saw mixed results, and their experience with this project did not convince them of a clear advantage to using fertigation or foliar application over the more traditional method of using compost.

One of the biggest lessons learned was that it is difficult to conduct any kind of research among a loosely organized cooperative of independent market farmers who are all busy. The farmers entered into the project with the assistance of university and Extension researchers, but did not receive as much direction and support from them as they initially expected. The farmer who volunteered to share the lead in writing the project design failed to anticipate the time commitment needed to make the project successful, especially considering that they overestimated the availability of researchers.

The project participants discovered that if a group of farmers decides to do such a research project together, they should be certain that 1) they have well-established lines of communication, and 2) they are all clear about the division of labor and how much time investment is needed, especially by those playing a coordinating role. They should also get a clear commitment from those who are providing expert assistance.

Detailed results from each farm are as follows (see Table 1):

Hoyland Farm
The whey-fertigated plot had the highest yield of both numbers and total weight of tomatoes: 163 at 48.27 pounds, for an average weight of about 0.3 pounds each. Yield from the non-fertigated plot was 131 at 31.72 pounds, averaging 0.24 pounds each. Although the fish-fertigated plot had the lowest count, 117, their total weight was slightly higher, 32.15 pounds, for an average weight of 0.27 pounds.

The Kansas City Community Farm
The plot receiving fertigation but no foliar feeding had the highest yield (187.7 pounds) followed by the plot that received neither fertigation nor foliar feed (163.6 pounds). The plot with both foliar feed (fish) and fertigation yielded 143.7 pounds, and the plot with no fertigation had the lowest yield, at 107.2 pounds. Cull rates ranked differently than yield: the plot receiving both fertigation and foliar feeding had the lowest cull rate, while the fertigated, non-foliar plot had the highest.

Bear Creek Farm
The highest yield (95.58 pounds) was collected in the plot receiving both fertigation and foliar feeding, followed by the control plot (88.14 pounds). The fertigated, non-foliar-fed plot had the lowest yield, at 86.68 pounds. The control plot had the fewest culls, while the plot receiving both fertigation and foliar feeding had the most culls.

Wood Moods
The fertigated, non-foliar plot had the highest yields in number and weight for both grades 1 and 2 (256 tomatoes and 0.5 pounds for No. 1). The lowest yield in count and weight for both grades was in the fertigated, foliar-fed plot, although the average weight per No. 1 tomato was similar, 0.49 pounds. The non-fertigated, foliar-fed plot out-produced the control plot with no fertigation or foliar feed. The number of non-fertigated, foliar-fed No. 1 tomatoes was similar to those of the fertigated, non-foliar one (252), but the average weight of the former was slightly lower, at 0.47 pounds.

Sandheron Farm
A greenhouse accident destroyed most of the starts before they could be transplanted, so this farm only completed a partial trial.

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