

Improving Small Garden Farm Productivity by Extending the Growing Season and Avoiding the Uncertainty of the Weather Conditions

Final report for FNC16-1030

Project Type: Farmer/Rancher

Funds awarded in 2016: \$7,392.00

Projected End Date: 01/30/2018

Grant Recipient: Cicero Farm Market

Region: North Central

State: Indiana

Project Coordinator:

[Karen Carlisle](#)

small farm

Project Information

Summary:

Annual progress report for Cicero Farm Market Grow bag project for year 2016

Background: During the 2015 growing season, the Cicero Farm Market Garden lost all their outside in-ground tomato plants due to excessive rain that drowned most of the outdoor plants. The excess water even invaded the sides of the high tunnel and adversely affected many plants in there as well.

Because of this effect from excessive spring rain, I (Ron) began to search for a potential solution, concentrating on alternative growing methods for tomato plants that would avoid the drowning problem and could potentially extend the growing season by proper utilization of the available unheated hoop house/high tunnel.

The alternative growing methods centered on 2 novel techniques - a fogger/mister system for rooting cuttings from mature tomato plants and cloth grow bags for aboveground plantings.

Starting in the fall of 2015, I rescued discarded mature tomato plants for the high tunnel that had withered and not produced many tomatoes. I put them in a Walmart cloth blue shopping bag with Miracle Grow potting mix and placed them on my back patio in full sun. Plants began to thrive. I then made cuttings from mature plants at the garden and rooted them in the fogger bucket. Roots showed after 8 to 10 days, enough to plant them in grow bags. When the weather turned too cold to keep them outside, I brought them inside and kept them growing through January.

Conclusion: The grow bag approach would work.

Starting in March 2016, I (Ron) planted 15 tomato seedlings that Duane and Karen had started from seed in their basement - started out about 3" to 4" tall and slightly on the yellowish side since the seedlings had not received added nutrients. Also potted 3 cabbages in grow bags in larger round totes.

The tomato seedlings were potted in the cloth blue Walmart shopping bags with plastic laundry totes from Dollar Tree store, utilizing an organic 50/50 mix of potting soil/compost. The plants were transferred to the Cicero Garden high tunnel in early March, and covered with a commercially available white foam blanket during the several hard frosts that occurred during March through May. The plants grew well and began to flower extensively. I watered daily from the top of the bags. Also began to monitor the temperature with a digital thermometer that recorded the high and low each 24 hr period.

Several weeks later I added a dozen additional tomato plants from Walmart and Lowes, also put up in the same grow bags/totes and used Miracle Grow potting mix, and added plastic bins to hold water so they could be filled with water daily.

All the plants grew, but the second set in the Miracle Grow potting mix looked greener and healthier than the first set. Added minerals to all plants - magnesium as Epsom salt, calcium nitrate, potassium sulfate and organic fertilizer.

Tomatoes began to grow and the first fruits were harvested in the first week of June from the largest starter plant from Lowes. All plants had green tomatoes popping out. However, the temperature inside the hoop house began to rise during the day to over 100 degrees, topping out at 122 degrees.

Duane opened up the sides and ends for more air circulation, which kept the day temperature on sunny days to 95 - 100 degrees. However, the number of tomato flowers dwindled and many dried up from the constant high temperatures. Also the water supply at the garden proved to be unreliable due to the added drip lines for field planting, so the project was suspended in the high tunnel until more water lines were put in. Note: More water lines were installed in late fall/early winter 2016.

So in early June I (Ron) transferred 8 of the second string of tomato plants to my backyard where I could water them on a daily basis, leaving them in the grow bags/plastic bins. I watered them at least daily by filling the plastic bins. They continued to supply ripe tomatoes on a daily basis until frost.

On January 16, 2017, tomatoes plants were started by seed in the basement of Duane and Karen Carlisle. These new tomato plants will be the parents from which our cuttings will be taken during the 2017 growing season.

Lessons Learned:

A. The grow bag approach allows early season plant growth in an unheated hoop house and allows maximum flexibility for movement of the plants as needed to optimize growth conditions. The use of plastic bins underneath optimizes watering to the plants' needs - the plants uptake the water at different rates as their individual growth requires, and will allow development of an automatic watering system utilizing a reservoir/float valve control for each plant

B. The early start of the grow season in the hoop house worked fine, but the rapid rise of the internal temperature on sunny days requires more air circulation to prevent flower damage and stunting of the plants. This was probably the cause of poor tomato yield last year in the hoop house and proves the need to monitor temperature extremes - high and low - on a daily basis

C. Seedling condition and sufficient added minerals/fertilizer early on is clearly needed to provide for hearty plant growth and to maximize flower production without blossom end rot.

D. Additional plant nutrients/minerals need to be added on a regular schedule to optimize plant growth and maximize yield.

E. The grow bag approach with fogger rooting of cuttings should allow the tomato season to be extended well into the late fall/early winter in the unheated

hoop house.

I, Karen, worked on our project for the 2017 gardening season. As earlier mentioned, we started our new parent tomatoes from seed on Jan. 16, 2017. In mid March, Ron, Duane and I transplanted them into the grow bags which had the same soil as the high tunnel. The bags were then transported to the small heated hot house where the tomatoes continued to grow and thrive. A small automatic heater kept the night time temps above 45 degrees. Early April the heater went out and all the tomatoes in the grow bags froze.

Fortunately, we had started plenty of seeds and were able to transplant again into the grow bags.

Mid April the grow bags were transported into the larger 50' by 100' high tunnel. This high tunnel had better air circulation than the one we used in 2016.

To compare the grow bag tomatoes' growth rate and productivity to the in-ground tomatoes, the bags were placed in a row next to the in-ground tomatoes. The grow bag tomatoes produced as well as the in-ground tomatoes. Had the heater not malfunctioned, the tomatoes in the grow bags would have been more mature at the time they were placed in the high tunnel and I believe tomatoes would have been ripe by mid June, just like they were in June of 2016.

Again we used both a drip line watering system as well as the underneath plastic bins both outside and in the high tunnel.

Even with losing the first grow bag plantings, tomatoes were harvested five weeks earlier than the open field tomatoes.

In late June we started taking cuttings from our parent grow bag tomatoes. Three weeks later we transplanted large well-rooted offspring into the high tunnel and they produced medium size ripe tomatoes in less than 6 weeks. This process was repeated again in late July and these tomatoes continued producing until frost.

Project Objectives:



tomato stems in misting bucket



roots developed in 7 to 14 days

Our objective in this project was to find a way to extend the growing season and avoid the uncertainty of the weather conditions primarily for tomatoes. We experimented with a fogger/ misting system which allowed us to take cuttings from mature tomatoes plants, place them in the misting bucket until roots developed and then transplanted into cloth grow bags.

Research

Participation Summary

2 Farmers participating in research

Educational & Outreach Activities

20 Consultations

5 Curricula, factsheets or educational tools

1 Tours

3 Webinars / talks / presentations

1 Workshop field days

PARTICIPATION SUMMARY:

3 Farmers

1 Ag professionals participated

Education/outreach description:

These are the power point slides we used for our presentation at the 2018 Indiana Horticultural Congress

Click [here](#) to view a larger version of these slides.

INDIANA HORTICULTURAL CONGRESS 2018

Extending the Tomato Season

An On-Farm Research Report
Feb 14, 2018
Koren Carlisle & Ron Benvenuto

► Indiana Horticultural congress - 2018 Extending the Tomato Season

OBJECTIVES

- PROTECT AGAINST SPRING FLOODING
- EXTEND TOMATO GROWING SEASON
- OPTIMIZE GROWING CONDITIONS
- MINIMIZE OVERHEAD COSTS

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METHODS – EQUIPMENT - TECHNOLOGY

- Grow-bags
- Roofing by Fogger
- High Tunnel
- Portability of Plants
- Watering/Feeding by Absorption

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THE CICERO GARDEN - RT 19, NORTH OF CICERO

CICERO FARM MARKET
SUN-FRI 1000-7PM
STRAWBERRIES TODAY

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• Indiana Horticultural congress - 2018 [Extending the Tomato Season](#)

THE HOOP HOUSE AT CICERO GARDEN



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FOGGER



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FOGGER RESULTS



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GROW BAG SETUP OUTSIDE



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GROW BAG SETUP INSIDE



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SEEDLING STARTUP IN BASEMENT



SEEDLINGS INTO GROW BAGS



GROW BAG SETUP HOOP HOUSE



SEEDLINGS IN GROW BAGS IN HOOP HOUSE



GROW BAG SETUP FROST BLANKET

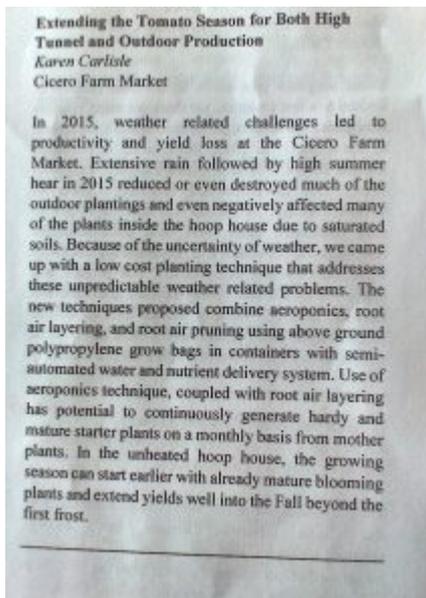




Instructions for making the misting bucket: The top of the 5 gallon food grade bucket was drilled with a bunch of holes large enough to fit tapered soft clear plastic cups with their bottoms cut out. The plastic cups acted as holders of the tomato plant stems via the sponge collars cut from a swim noodle that already had a center hole big enough to restrain a tomato plant cutting without damaging it. This allows the bottom of the plant stem to protrude down far enough into the 5 gal bucket to be bathed in the "fog" that accelerated root growth. The fogger unit was purchased at [The House of Hydro.com](http://TheHouseofHydro.com)



2018 poster session abstract book for Indiana Small Farms Conference



our information in abstract book



This is the poster we presented at the Indiana Small Farm Conference where approx. 300 people were exposed to the results of our project. [View as pdf](#)

Learning Outcomes

6 Farmers reported changes in knowledge, attitudes, skills and/or awareness as a result of their participation

Lessons Learned:



when selecting tomato stems for rooting,
look for the tiny hairs



it's possible to take a cutting that already has small
fruit



ripe tomatoes in grow bags taken
from cuttings

Lessons Learned: from year 2016

1. The grow bag approach allows early season plant growth in an unheated hoop house and allows maximum flexibility for movement of the plants as needed to optimize growth conditions. The use of underneath plastic bins optimizes watering to the plants' needs - the plants uptake the water at different rates as their individual growth requires, and will allow development of an automatic watering system utilizing a reservoir/float valve control for each plant
2. The early start of the grow season in the hoop house worked fine, but the rapid rise of the internal temperature on sunny days requires more air circulation to prevent flower damage and stunting of the plants. This was probably the cause of poor tomato yield last year in the hoop house and proves the need to monitor temperature extremes - high and low - on a daily basis
3. Seedling condition and sufficient added minerals/fertilizer early on is clearly needed to provide for hearty plant growth and to maximize flower production without blossom end rot.
4. Additional plant nutrients/minerals need to be added on a regular schedule to optimize plant growth and maximize yield.
5. The grow bag approach with fogger rooting of cuttings should allow the tomato season to be extended well into the late fall/early winter in the unheated hoop house.

Additional lessons learned from 2017

1. It is possible to extend the tomatoes season by 2 1/2 extra months. Harvesting the first tomatoes by June 10th and the last tomatoes Nov. 15th
2. Different varieties of tomatoes root faster than others.
3. If the grow bag system is going to be used outside a hoop house, determinate tomatoes are the best to use. The indeterminate varieties are too difficult to move about.
4. Since the determinate varieties of tomatoes have a limited production life, using

the grow bag approach with fogger rooting of cuttings will produce additional plants, which means more productivity will be realized.

Project Outcomes

2 Farmers changed or adopted a practice

Recommendations:



this plant was rooted in misting bucket and planted directly in ground.
Ripe tomato in 8 weeks



4 weeks after planting. Cutting had
been rooted in misting bucket

I believe this method could be expanded even more. If a cutting was taken from a

parent tomato plant just prior to frost, rooted, planted in a grow bag and kept in a warm place, either in a heated greenhouse or in a basement under lights, this would become the new parent plant from which many cuttings could be taken. It's very conceivable that tomato plants could be ready to bloom at the time they are placed in the high tunnel, thus resulting in an even earlier harvest.

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture or SARE.



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