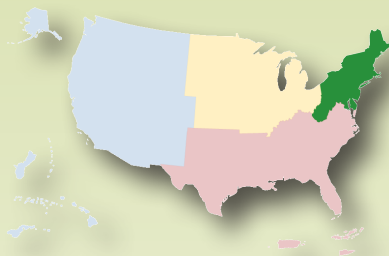


FARMER & RANCHER INNOVATIONS

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



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Written by SARE staff and reviewed by Extension specialists.



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New York Farmer Uses Hanging Gutters to Utilize Overhead Space in Hoop House

Project Summary

This project looked at increasing the productivity and cost effectiveness of growing more crops in a hoop house by utilizing the overhead space. Farmer Kurt Forman, of Palmyra, N.Y., and Cornell Cooperative Extension Vegetable Specialist Robert Hadad looked at using a hanging gutter system to raise selected crops over the existing in-ground crops. They looked at cost-effective design, operation, production strategies, cost of production and profitability of such a system.

Forman's farm is almost completely certified organic, and is in USDA plant hardiness zone 6a.

Top Findings and Lessons Learned

- Forman experienced irrigation challenges: a potting soil mix with inadequate water-holding capacity forced him to spend too much time watering and monitoring soil moisture. This was resolved with drip tape and a different soil medium with improved water-holding capacity.
- Understanding daily temperature changes in the hoop house's overhead space

COVER PHOTO: Kurt Forman uses the winch system he installed to make the job of raising and lowering his hanging gutters easier. *Photo courtesy Kurt Forman*

made it difficult to manage for both cool- and warm-season crops.

- Over time, Forman improved his system for managing the weight of the overhead gutters, including installation of winches. This also proved a significant time saver: The winch allows one person, rather than two, to raise and lower the gutters, and to do it more quickly.
- Being able to stand while harvesting offered a significant improvement in worker comfort.
- Crops grew more vigorously in the gutters when planted in single rows as opposed to double rows. Overall, yields were comparable to those in the fields and the hoop house ground.

The Gutter System in Depth

Forman and Hadad installed a total of 14 gutters in one hoop house, at a cost of \$345.93 (see Table 1). Four are rain gutters with end caps—two aluminum and two plastic—and the other 10 are made of 6-inch schedule 40 PVC pipe, split lengthwise to create the planting bed. Two by fours were screwed to the bottom of the rain gutters to provide stability.

The gutters were attached to the hoop house's frame with a system of pulleys, clamps, wire and either steel cable (for the PVC gutters) or baler twine (for the rain gutters). Forman discovered that the twine would fray and break, and planned to replace it in favor of stronger cable. Also, the steel cable came undone from one PVC gutter during high winds, so Forman decided to better secure the cables using two deck screws installed at each end of the gutters.

The gutters were installed so that one gutter connected to one hoop on 14 consecutive hoops, out of a total of 25 hoops in the structure. Forman paid close attention to whether the hoop house would be able to bear the extra weight of the gutters, and found that it could without the need for additional reinforcement to the structure.

Forman and Hadad intentionally oriented the gutters in a north-south fashion to help increase sunlight penetration to the crops below.

The dimensions of the gutters are as follows:

- PVC gutters: 5.5 inches wide by 120 inches long; an area of 660 square inches (4.58 sq. ft.)
- Plastic rain gutters: 4 inches wide by 120 inches long; an area of 480 square inches (3.33 sq. ft.)
- Aluminum rain gutters: 4.5 inches wide by 120 inches long;



COVER PHOTO: (above) Kurt Forman initially used twine to hold the gutters aloft, but found it would fray and break, so he eventually used steel cables. (below) A detail of the winch he installed to make raising and lowering the gutters easier. *Photos courtesy Kurt Forman*

an area of 540 square inches (3.75 sq. ft.)

Because it was difficult to raise and lower the gutters by hand—particularly after watering—Forman installed a winch system for three of the gutters. He connected the cables of each of the three gutters to a pipe, and then connected that pipe to the winch cable. He found that, probably because of an uneven weight distribution in the gutters, the winch did not raise and lower them smoothly. He planned to continue refining this system.

Crop Production in the Gutters

Forman filled the gutters initially with a Sun Gro potting mix, but experienced inadequate fertility and poor water-holding capacity. Particularly in hotter weather, he found it was necessary to water the gutters frequently, and to attend to

them carefully to avoid over watering. He resolved this challenge by installing a drip irrigation system, and he continued to experiment with different soil mixes. He had success with a vegetable-based compost in a soil mixture developed by a local organic grower, which allowed greater moisture-holding capacity and initial fertility, and was of comparable cost.

While Forman did not track how much time it takes to manage this system, these two improvements—adding a winch and improving water management with drip tape and better soil—addressed the most labor-intensive aspects of the system.

He focused on ground cherry production, because he thought putting the plants in the air with a net below them would make harvest easier. He tried other shallow-rooted, cool- and warm-season crops, including sugar snap peas, Asian greens, lettuce, spinach, gherkin cucumbers and cilantro. He found that, due to a tendency toward high temperatures in warmer seasons, that cool-season crops fared well only in early and late months.

He found one advantage to this system was a lack of weeds. However, at one point while experimenting with different soil mixes he added barnyard soil to one gutter, which brought with it weed seeds. In this instance, he felt that the weed pressure outweighed the water-holding benefit of this particular soil.

Forman compared yield of these crops when grown in the gutters, in the hoop house ground, and outside in fields, and found them to be comparable. This was especially true after switching from double-row seeding to single rows. Another adjustment he planned to try was taking new PVC pipes and cutting a narrower slot in them, which would allow for more soil volume and expose less soil to the air, possibly reducing evaporation.

TABLE 1. COST OF THE GUTTER SYSTEM

14 Gutters 2 x aluminum house gutters with endcaps 2 x plastic house gutters with endcaps 10 x 6" Schedule 40 PVC pipe	\$79.59
Stainless steel cable, clamps, pulleys and wire	\$86.66
Winch with brake	\$74.85
Irrigation supplies Drip tape, shutoff valves, braided hose, 0.75" black poly pipe, barbed fittings, hose clamps	\$94.51
1.315" pipe connecting gutter cables to the winch cable	\$10.32
TOTAL	\$345.93

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