

Final Report
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Proposal Category: ☐ **Research** ☒ **Outreach**

Proposal Status: ☒ **New Proposal** ☐ **Previously funded by SRSFC**

Title: Pack N Cool Portable Cooling System for Small Acreage Growers

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Objective:

Test Pack N Cool system for adaptability to direct marketing opportunities

Justification and Description

The Pack N Cool trailer was designed as a way for growers to easily and cheaply adapt a retail 5 x 8 cargo trailer for cooling of produce. It consists of adding several inches of styrafoam insulation on top, bottom, and sides of trailer, and inserting a room air conditioning unit of 12,000 BTU. A sensor is added (cool bot) to keep the unit running until the desired temperature is reached (37 F is lowest suggested temperature). The trailer is equipped with both 110 a/c and with a generator to allow cooling both en route and at destinations. Supplies, including trailer, run about \$4,000. The 5 x 8 trailer can hold about ½ palette of produce, or 20-30 bags (50 lbs/bag) of sweet corn

We have used the trailer as a demo at growers meetings and also beta tested it for a local grower this summer. Currently, we have some funding from a Walmart competitive strawberry grant to test the unit for field cooling strawberries. Reports from the local grower were positive and provided some new ways to approach use of the trailer. Perhaps the strongest economical

advantage to the grower was one we had not considered. Typically, produce is loaded Friday afternoon and early Saturday for Saturday direct markets here. By using the trailer, the grower was able to prepack produce on Friday and eliminate the need for early morning labor.

Materials and methods:

A larger trailer (6 x 10) is under construction utilizing experimental food grade, plastic insulated panels from BASF. This unit will be used for larger loads of produce to test time to cool a half or full size pallet to $\frac{1}{2}$ and $\frac{7}{8}$ final desired temperature. Ibuttons (from QA supplies) and a larger instant reading wireless thermometer will be positioned throughout the trailer to follow air flow and data collected via laptop computer. A diamond steel floor covering will be added to help make the unit more durable.

A video showing construction, including changes (added electrical receptacles to add small fans for better air circulation, LED lighting, installation of one or more plastic curtains (to form multi compartments) will be posted on our PHHI website and provided to the SMFRC for accessibility.

Timeline:

Winter 2014. Complete trailer unit, start testing for air flow.

Spring, Summer 2014. Test with loads of produce of multiple temperature needs (from 40 to 55 F) to determine maintenance of desired temperatures and presence of cold/hot spots.

Summer, Fall 2014. Partner with a grower who attends the large Tryad terminal market near Greensboro to beta test the trailer for this type of use.

Results:

The Pack N Cool Plus trailer was completed in early spring (Figure 1). It incorporates the air curtain, diamond steel plating and A/C unit. We found that a local trailer sales (Beam trailers, Mooresville NC) could custom order the trailer with a slightly longer tongue, long enough to incorporate a generator, and with a slightly taller trailer (6' opening after addition of foam insulation). Louis Wojciechowski, our original designer and builder, left NCSU and contracted with us to build the unit (Wo-Jo Fabrications, Kannapolis NC). Materials and costs are provided in Table 1.

We obtained the completed trailer a little too late to test it on strawberry harvests in May and June. However, we did use it for cantaloupe and to hold watermelon at 13°C, over a 3 week interval. Using one 15,000 BTU air conditioner definitely was slower to cool the 6'x10' trailer compared to the 5'x8' trailer we had built previously. The area furthest from the cooling unit took an additional 30 minutes to cool to 13°C when outside temperatures were 32°C. We will have to test use of a fan mounted on the wall and plugged into the receptacle to see if air circulation can be improved.

The video for construction was not possible due to the departure of Mr. Wojciechowski, but we are posting the final photos to show construction aspects. At this time, we are comfortable with understanding how the 5x8 trailer works but we need more data for the 6x10 trailer to better predict cooling times for commodity types and loads and how to modify the unit for more efficient packing and cooling. The trailer was taken to several field and grower day events so

that growers could see what the trailer looks like and how it is put together as listed below: June 2014: Pack N Cool and Pack N Cool Plus taken to Small Fruits field days in Sandhills and Salisbury (15 growers).

July 29, 2014 Pack N Cool Plus taken to beginning farmers workshop, Wilmington NC (11 growers)

September Pack N Cool Plus to beginning farmers workshop, Winston-Salem (20 growers)

October 10, 2014 Pack N Cool Plus demonstrated at growers field day, Killdeer Farm, Kings Mountain, NC (30 growers).

An unexpected training event occurred with the Pack N Cool Plus. Two undergraduates and two technical staff were the public speakers to explain the trailer and how it was constructed at a couple of the above events.

Conclusions:

The Pack N Cool Plus is a trailer designed for inexpensive and rapid cooling in small operations where a refrigerated truck is not yet needed. The trailer can also be used for produce or other applications requiring cooling. While the cool bot fools the AC unit into running below the usual 60F cut off, it can only go to 35-36°F. The larger trailer (6x10') allows a pallet to be placed in the trailer with adequate cooling space around it, but a fan will need to be incorporated to circulate air for efficient cooling.



Figure 1. Pack N Cool Plus showing overall (A), front part with AC unit and baffle protector (top) and custom generator cage and generator (bottom) (B); curtain in back of trailer (C) and interior of trailer showing plastic sheeting, AC and cool bot, and diamond plate floor (D).