



ThermaRoot: heated and cooled benches for precision root-zone temperature control

PRESENTED BY COLBY WU, BUSINESS DEVELOPMENT

ThermaRoot: Heated & Cooled Benches

- Optimizing root-zone temperature in greenhouses
- Research collaboration with Green Search Inc.
- Developed by Stratus Plastics International Inc.
- Organic cucumber & pepper trial results
- Patented



What is ThermaRoot?

- Heated and cooled bench system
- Targets root zone, not ambient air
- Adaptable to existing greenhouse benches
- Uses conductive thermal regulation
- Designed for year-round climate control

Heat and Cool source can be from
Geothermal, Solar, Ground water and etc.
Dependent on location and grower



How It Works

- Hot or cold water lines run through insulated material over plastic benches
- Growing bags are placed on top of the system
- A blast chiller is used to cool; hot water tank to heat lines
- Heat or cooling is delivered to bottom of the bag → directly targets root-zone
- Water recirculates



Why Root-Zone Temperature Matters

- Directly impacts plant growth and yield
- Affects nutrient uptake and stress response
- Air heating does not regulate roots effectively
- Fluctuations lead to fruit deformities
- Root stability = better crop performance



Greenhouse Trial Setup

- 2-acre organic greenhouse in Ontario
- English cucumber and bell pepper crops
- Control vs. heated benches
- Control vs. cooled benches
- Daily data on growth and marketable yield



***Green
Search
Farms***

Green Search Inc.
R&D FACILITY

Bell Pepper Results - Heating

- Heated = 27% heavier average fruit in June 2025
- Fewer deformities, more marketable fruit → blocky shaped
- High amount of culls (unmarketable) in control group
- Lower stress and nutrient deficiency signs
- Ongoing trials beyond winter season



Control



Trial

Figure 1a and b. Bell peppers grown on heated benches demonstrated greater developmental characteristics and higher long-term fruit weight compared to those grown under control conditions.

Cucumber

Heating Results

- 6% higher yield vs. control benches in May 2025
- 223.2 vs. 210.4 cucumbers per day
- Fewer culls: 7.5 vs. 8.76 daily
- Stronger performance in cooler months
- Root heating improved fruit consistency



Trial

Control

Figure 2. The above image illustrates the difference between fruit size between the heated (left) and non-heated/control (right) groups of English cucumbers. Side-by-side comparison illustrates that the heated side is approximately 20% longer, demonstrating the effect of heat on growth.

Cucumber Cooling Results

- Cooling reduced root zone 1–4 °C
- Passive surfaces already affect temperature
- Early data shows fewer culls (~50%)
- Improved yield and fruit consistency
- Full cooling system now being evaluated



Why It Matters

- Boosts food production sustainability
- Cuts energy costs with targeted control
- Reduces waste from poor fruit quality
- Supports organic and conventional growers
- Scalable, research-driven agri-tech solution



Temperature sensor in the middle of the bag, was able to cool down in the middle of summer by 4-5 C degrees in this organic bag.

We believe in the Grodan slabs, we would be able to effectively control root zone temperatures during the hottest parts of the day.





Open Style gutters will create a platform for this system to fit into

ThermaRoot, sits underneath of the open style gutter systems. This allows the product to be completely protected, Insulated panel allows for the heat and cold to travel upwards, becoming the most efficient way of heating and cooling root zone temperatures.



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