Growing under the midnight sun

Welcome to Pike's greenhouse!

Here you'll find:

- **cutting edge horticulture** research—focusing on **hydroponics**
- **on-the-job training** for young Alaskans
- **public education** and outreach about **Alaska agriculture**

and of course, fresh, tasty vegetables!

No doubt you've noticed the round-the-clock daylight that interior Alaska experiences in the summer. This can be advantageous or challenging for farmers, researchers, and horticulturists. As Alaska strives to become more sustainable we must accept these challenges and take advantage of the opportunities.

The endeavor here at Pike's greenhouse is a partnership involving the **University of Alaska Fairbanks School of Natural Resources and Agricultural Sciences**, local **FFA chapters**, and **Pike's Waterfront Lodge**.

Under the direction of Dr. **Meriam Karlsson**, professor of horticulture, and **Jeff Werner**, research professional, at UAF, the project incorporates many aspects of research. At this and other sites, Dr. Karlsson and Mr. Werner are working to make locally-grown produce in remote Alaska regions a reality. In cold frames, high tunnels, or high-tech facilities, researchers are focusing on plant requirements, varieties, and treatments to maximize productivity for growers. Objectives are

PIKE'S Waterfront Lodge

SNRAS
SCHOOL OF NATURAL RESOURCES & AGRICULTURAL SCIENCES

Alaska GROWN

FFA

UAF
UNIVERSITY OF ALASKA FAIRBANKS

to develop cultural management techniques and reliable protocols to efficiently produce suitable vegetables, culinary herbs, small fruit, floral, and hanging basket crops in various environments.

Dr. Karlsson's work determines the best materials for high tunnels so that crop productivity is expanded. She studies specific crops, including tomatoes, lettuce, green beans, and strawberries, so that optimum conditions for best output can be shared with agricultural producers across the state. Partnerships with commercial enterprises such as Pike's Waterfront Lodge and Chena Hot Springs Resort not only provide scientific expertise to the businesses but showcase innovative agricultural methods such as hydroponic techniques to the public in a positive light.

Hydroponics

Originally, growing plants with the roots immersed in a water solution of nutrients was called hydroponic culture or hydroponics. Over the years, hydroponic systems have become equivalent to soilless production techniques. In these systems, the required nutrients are dissolved in water and provided to the roots held directly in the solution or in a prepared growing medium. The growing medium can be organic or inorganic and may consist of a single or several mixed materials such as peat moss, gravel or perlite (siliceous rock). Advantages of hydroponics include the lack of soil-borne pests and diseases, opportunities for precise nutrient control and automation, efficient use of water and nutrients, rapid turn around, easier harvest and management, year round use, and faster production cycles.

Tomatoes

Tomatoes are grown here for the Pike's Landing Restaurant. In addition to demonstrating an efficient hydroponic greenhouse production system, Karlsson and her team are looking at rates of photosynthesis in the plants. There are still lots of questions concerning the adaptations of plants to continuous summer light. Tomatoes are not fully adapted to continuous light without a natural dark night period. Still, tomatoes produce high yields in interior Alaska. "We want to find out if these plants continue to grow throughout the day or if they are able to keep track of the twenty-four hour cycle and shut down photosynthesis at what would be the dark night time," Dr. Karlsson explained. "We will be monitoring and recording photosynthetic rates throughout the twenty-four hours during the longest day of summer (June 21) and compare to the shorter days of late August. We need this information to get a better handle on how to manage the plants and how to best grow tomatoes throughout the year with really short days when supplemental lighting is necessary. We are also researching how to best manage greenhouse tomatoes, including the most efficient nutrient management procedures."

Most of the tomatoes are of the variety Trust with 7-7.5 oz. fruit size. In addition, we have several cherry tomatoes including Conchita (fruit size 0.75 oz.) and Picolino (0.75 oz fruits).

Cucumbers

We are growing cucumbers as well. The long European cucumber cultivar is Cumlaude (15-16 inches long). The Manar cultivar is half the length (7-8 inches) of the traditional cucumber.

More

Lettuce for the restaurant salads and a variety of herbs, including mint, thyme, oregano, and sage, are also grown.

Training future farmers

The greenhouse and grounds at Pike's employ several high school students who are involved in FFA. UAF students majoring in natural resources management serve as supervisors and managers in partnership with UAF to provide job training opportunities. In addition to learning about plant growth and care and landscaping, the students get many opportunities to interact with the public and answer questions about Alaska agriculture.

Hydroponic Production Systems at Pike's Greenhouse

Nutrient Film Technique (NFT)

The plants rest in an enclosed growing channel. A nutrient solution is circulated through the channel providing a constant flow or film of nutrients around the roots. The solution remaining after passing through the channels is returned to a stock tank and nutrients, pH, electrical conductivity,1 and water levels are adjusted before re-circulation.

Ebb and Flow (Flood and Drain)

Ebb and flow is a simple and reliable form of hydroponics requiring a low initial investment. The plants are grown in pots filled with a peat-based medium or inert material and placed in a tray. At regular intervals, a pump fills the tray with nutrient solution. After a few minutes, the solution drains back into a reservoir. The medium anchors the roots and functions as a water and nutrient reserve as the hydroponic solution is alternatively flooded and drained.

Dutch Bato Buckets

These containers have a small siphon pipe at the bottom to regulate the nutrient solution to about a one-inch depth. The small bottom reservoir of solution keeps the growing medium moist between irrigation cycles. These containers are designed to be irrigated with a drip emitter and are plumbed to a stock tank through a common PVC pipe (2-inch diameter).

Aeroponics (AEROFLO²® 30)

The roots are maintained in an environment saturated with a mist of nutrient solution. The method requires no substrate but some technique is needed for supporting the plants to allow continuous wetting of the roots with a fine nutrient spray.

Aerogarden

This is an automated application of aeroponics using water, nutrients, and and air to grow herbs, vegetables, and flowers in the home. The unit has built-in lights on timers and comes with seeds and fertilizer tablets. No prior knowledge of growing plants is needed as the system alerts you when to add water and nutrients.

Floating Pond System

The plants are seeded in rockwool or oasis foam cubes. After germination and seedling development, the cubes are moved to holes in Styrofoam "boards" and floated on a pool of nutrient solution. Air is usually bubbled through and the solution is in constant circulation. Water and nutrients are monitored and added as the crop uses the nutrient solution for growth and development.

Vertigro (Vertical Growing)

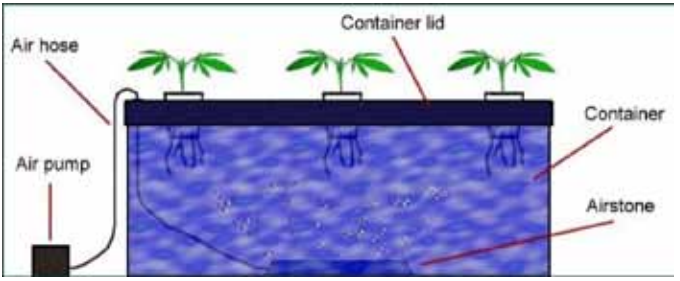
This is a system with stackable pots to allow increased space utilization. Water with the dissolved nutrients is applied in a drip system at the top and trickles through the pots and plants. The growing medium is perlite[2] or other inert material. The solution after draining through the tower can be collected and re-circulated.

Drip Hydroponic System

In this system, a nutrient solution is dripping onto the surface of the medium around the plant in the top growing container. The solution drains into a second reservoir container and the solution is recycled using an aquarium pump. A larger reservoir can charge several modules or nutrient solution can be added manually to each individual unit as the solution drops. The blue drain level tube on the unit to the right indicates the solution level in the lower container.

Deep Water Bubble System

This is a culture system with a static nutrient solution aerated with an aquarium or air pump. Fresh nutrient solution or plain water may be added daily to keep a constant solution level. As the nutrient concentration drops, the nutrient solution can be completely changed or nutrients added based on an electrical conductivity1 reading.



Rockwool Blocks

Rockwool is made from basalt rock, chalk, and/or sand melted at 3000˚F. The molten rock is spun into a wool of fine intertwined fibers. The resulting product absorbs water while still providing air to the roots. A nutrient solution is applied several times during the day through drip emitters.

Top Irrigation

In top irrigation, nutrient solution is periodically applied to the medium surface. This may be done manually or through drip emitters to containers filled with peat or other inert medium. When automated, the nutrient solution can be scheduled for delivery multiple times each day.

Notes:

1. Electrical conductivity (EC) is a measure indicating the amount of nutrients in the solution.

2. Perlite is a siliceous rock. When heated to 1600°F, it expands into light white crumbs suitable for horticultural applications.

Thank you for visiting!

For more information please see www.uaf.edu/snras/.

Meriam Karlsson (ffmgk@uaf.edu)

Jeff Werner (fnjww@uaf.edu)

School of Natural Resources and Agricultural Sciences
Agricultural and Forestry Experiment Station
PO Box 757200 • Fairbanks, AK 99775-7200
University of Alaska Fairbanks – Alaska's Land Grant Institution

MP 2009-06

Above: the exterior of Pike's Greenhouse. Below: Jace Bures, manager of the greenhouse at Pike's and UAF senior in Natural Resources Management.