

Using Sustainable Energy to Extend the Growing Season

by Art Nash

Though there is no recognizable record or research definitively showing how much in-state food supports Alaska's population, the state Division of Agriculture has claimed for the last couple of decades that Alaskans grow only about 5 percent of the food consumed in state. This is a concern, as many recall food shortages right after the 1964 earthquake, which prevented Anchorage from getting supplies from the Lower 48 for some time. Some remember canceled cargo and passenger flights in 1991, caused by the eruption of Mount Spurr, and again in 2001, when fear of terrorist attacks cut off all commercial flights for more than a week. The Department of Energy (DOE) has looked at what would happen to the state's food supply if a major earthquake disabled transfer of agricultural goods from the Lower 48, and it estimated that for Interior Alaska there would be less than a couple of weeks worth of stockpiled food. The most recent USDA Food Security Survey, from a dozen years ago, ranked Alaska second from the bottom (next to Colorado).

Increased awareness of natural disasters and security issues along with concerns about food safety and the desire to eat healthy, local foods has created an interest in growing more food in gardens and in greenhouses, hoop houses and other season extenders. This is especially true in rural areas, where the cost of heating fuel and food can be several times as much as in urban areas. Interest in gardening with low hoop houses has increased in the temperate areas of Alaska, and some farmers are experimenting with growing in underground structures along the Kuskokwim River and using heat from burning discarded cardboard. Even in cloudy coastal communities such as Dutch Harbor, there has been a strong interest in figuring out how to grow produce in greenhouses attached to heated homes. This in-

terest in locally grown produce has increased in part because of the success of farmers markets and CSAs throughout Alaska.

One way to increase growing capacity is by extending the "shoulder" growing season, a couple of weeks before breakup and after the first frost into October. This is a way to get seed starts going earlier in the spring and for plants to mature later into the fall, when sunlight and natural heat are not as plentiful as during the summer days. With relatively large fluctuations between evening and daytime temperatures during these shoulder seasons, however, it is necessary to heat a greenhouse so that the temperature is more consistent throughout a 24-hour period. A more cost-effective method to speed germination is to produce seedlings in a basement or kitchen area.

Burning natural gas, propane or fuel oil to provide space heat in a greenhouse during the shoulder season is the obvious solution, but it may not be cost-effective for every home gardener. Another option is to transfer heat directly to the soil through some sort of fluid to help with germination in early spring. A grower can then heat the air within the greenhouse mainly in the fall to avoid freezing the lower stalks and leaves of plants (in particular, crops such as tomatoes and cucumbers). Frost cloths can also help retain heat. If you are planning to grow through the winter, which is possible in some parts of Alaska, light may also be a consideration.

Another way to extend the fall shoulder season is to store surplus summer heat, which new research by UAF Professors Sunwoo Kim and Art Nash may make possible in the future for residents who incorporate solar thermal collector boxes onto their small-scale greenhouses.

One well-known growing operation in Alaska is the greenhouse at Chena Hot Springs Resort. This operation uses local, naturally occurring geothermal heat, allowing crops to grow year-round. By growing their own fresh produce on-site, the owners are able to keep the costs down for their restaurant and hospitality business. However, most growers in the state do not have access to geothermal heat and must rely on other energy sources. With little natural gas and propane available in rural areas — where locally grown food is even less plentiful than on the road system — electric space-heating furnaces can cost two to three times more to operate than in urban areas. There is a project currently underway to deliver natural gas to the Interior with a possible extension to the farming area of Delta Junction. It remains to be seen if that will include propane, a traditional fuel for intermittently heating greenhouses.

Following are ways of curbing energy costs in shoulder seasons to encourage production:

- Install passive solar panel boxes, which absorb heat, collect it and transport it straight into the greenhouse. The collected heat can also be transferred into sandy ground or other storage material such as rocks or water under the greenhouse. This will help heat the greenhouse at night, when temperatures drop.
- Install a passive solar parabolic heating trough. This can concentrate water heated by the sun and then move it through garden hose to the soil used for germinating plants.
- Use wood pellets or cordwood in small, non-electric greenhouse stoves to create heat.
- If electricity is available, install light-emitting diodes (LEDs) close to row plants to stimulate germination.

- Place double-layered polyethylene-covered high tunnels in areas where permafrost is absent and growth is best right out of the ground (as in temperate coastal communities). Place a small fan to circulate air between the two layers of polyethylene sheeting.
- Build greenhouses next to community powerhouses to capture waste heat off generators from the production of electricity.

Research and educational efforts are also needed to encourage growers to extend their horticultural practices into the shoulder seasons.

- Study soil warming and space heating at a variety of sites in Alaska that reflect the vastly diverse soil and weather ecoregions of the state.
- Provide education for adults and K-12 youth (for example, through 4-H) through UAF Extension and other outreach entities.
- Provide education based on research and local experience to motivate small farm growers to enter the market.
- Demonstrate the uses of high tunnels, greenhouses and plastic ground covering for various regions of the state to encourage new growers.

Extending Alaska's growing season is one step toward improving the state's food security. It can also allow growers to produce local food that can be preserved for year-round use or supply the many popular and lucrative farmers markets on the road system in the state.

Cooperative Extension Service Publications

Controlling the Greenhouse Environment,
HGA-00336

A Solar Design Manual for Alaska, Sixth Edition,
Appendix B-Solar Greenhouses, EEM-01215

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