Strategies to stabilize locally grown produce for year-round sales: A feasibility study

One of the identified problems for locally grown produce is that it is seasonal and available only for a short period of time. Year-round availability is desired by food services (both institutions and restaurants). However, to attain this goal the product must be stabilized so that it does not spoil. This project evaluated different means of stabilizing the production (canning or freezing), studied pathogen reduction on several likely products, and determined feasibility of a small scale (1000 lb/hour) mobile processing unit. Freezing is seen as the preferred method, and pathogens are reduced to acceptable levels by blanching. A mobile unit was not feasible, but the equipment, energy, water, and employee requirements for a static processing plant were provided.

While many Iowa producers may be satisfied with the amount that they can produce and sell in a given season, others may feel that they need to expand their operation and sell product year-round. The results of this feasibility project show that a small processing facility could be developed that would allow individual and groups of producers to process enough products for year-round sales.

Background

Locally grown products traditionally are available during the months of peak ripeness and not during the winter months, which makes it difficult to fill the needs of commercial food service operations and non-retail food services. The goal of food processing is to ensure that products remain in a state that is acceptable to consumers. Refrigeration, freezing, heat processing and other practices have a long history of providing safe, moderately acceptable foods that are similar in quality to the original field crop. Each of these processes effectively stabilizes the field crop to allow storage and distribution and usually takes place at a centralized processing plant.

The question is whether on-farm small-scale stabilization of highly perishable foods (in this case, fruits and vegetables) is physically and economically possible. Successful stabilization would allow year-round sales of produce grown in Iowa.

Specific project objectives were to:

- Determine the types of food processing unit operations that would be suitable for small-scale mobile units,
- Determine the placement of pathogen reduction technologies within the operation to ensure that the mobile unit is capable of producing safe food,
- Determine the energy costs associated with unit processing of each selected
operation, and whether this would prevent adoption of the selected process,

• Develop plans and determine overall costs for construction of the pilot unit, and
• Determine the willingness to pay specifically for year-round availability of locally grown produce by institutions and consumers.

Approach and methods
A small-scale food processing unit was designed, energy and water usage were determined, and reduction of pathogens on produce in a laboratory setting was evaluated.

Results and discussion
A panel of food processing experts determined that a blanching/freezing operation would be the simplest, safest option that would produce the highest quality product for the consumer. The system could provide individually quick frozen (IQF) products using either a tunnel or spiral freezing unit. The ease of use, safety and quality of the end product were the deciding factors. Canning was determined to pose risks associated with inadequate thermal processing and there is lower consumer acceptance for canned products.

Pathogen reduction in a blanching/freezing operation was determined to occur at the blanching step in water near 212° F. Three pathogens—E coli O157:H7, Salmonella, and Listeria—were inoculated onto broccoli, green beans, edible pods (edamame) and asparagus before being blanched at recommended times and temperatures. All pathogens were reduced to non-detectable levels after blanching.

Design, energy, and water inputs and costs were determined for a blanching/freezing operation that could process 1,000 lbs/hour of any likely product. Overall, energy costs to operate all equipment in this process were determined to be nearly 200 kW (250 HP). (This refers to the overall requirements for the process as measured in generator requirements.) Water requirements were estimated to be near 100 gallons per hour, which could be a problem to access in a remote field location. It was estimated that four to five persons would be needed to operate the unit and perform subsequent needed tasks.

Conclusions
Overall cost for the equipment and power was estimated using 2008 values for new equipment and the cost of steel has dropped since then. The total equipment cost came to $1.2 million. The most expensive item was the freezer unit, costing approximately $370,000 with compressor.

The concept of a mobile unit was discarded in favor of a static, small-scale processing plant with ample frozen storage for bulk product. A processing plant must include the building, building renovations, personnel, installation, start-up and utilities. The equipment, installation and start-up are estimated to cost $1.7 million.
**Education and outreach**

Three presentations were made at the Iowa Network for Community Agriculture conference and the Marketing and Food Systems workshop sponsored by the Leopold Center.

**Leveraged funds**

The investigators have not yet leveraged any funds but continue to explore options with the Grow Iowa Values Fund, the Soybean Council and the ISU Value Added Agriculture Program.

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