Farm to Institution NEW ENGLAND

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Food Processing Case Study

INDIVIDUALLY QUICK-FROZEN (IQF) MACHINE SERVES UP THE LOCAL PRODUCE INSTITUTIONS WANT

FEATURED FACILITY: WESTERN MASSACHUSETTS FOOD PROCESSING CENTER

By Nathaniel Brooks

Members of "Team Carrot" process vegetables for the Pioneer Valley Vegetable Ventures line of IQF local produce.

To learn more about the Western Mass Food Processing Center, visit www.fccdc.org/about-the-center

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OVERVIEW

Name: Western Massachusetts Food Processing Center
Location: Greenfield, MA
Opened: October 2001
Business Model: non-profit
Staff: three full-time, five part-time (+/- three seasonal staff)

Facility at a Glance:

- 2k square feet of kitchen space
- Dry (3k square feet), cold and frozen (1.2k square feet) storage

Annual Revenue: $275k from operations, $164k grants
Total Clients to Date: 300+ (49 in 2016)
Services: professional development, technical assistance, business planning, product development, manufacturing and storage space rental, distribution resources, co-pack and contract manufacturing

More Information:
The Western Massachusetts Food Processing Center (WMFPC) is owned by the Franklin County Community Development Corporation (CDC), a not-for-profit economic development agency formed in 1979 to help the community take control of the region's future. In 2001, the CDC created the WMFPC with the specific mission to "promote economic development through entrepreneurship, provide opportunities for sustaining local agriculture, and promote best practices for food producers."

In the ensuing fifteen years, the center has served more than 300 clients and helped create over 100 jobs between facility staff and incubator clients. The WMFPC has also pioneered a number of attempts to improve the local food system, including becoming the first and only food hub in New England to purchase and operate an individually quick-frozen (IQF) machine.

KEY TAKEAWAYS

1. Even small IQF machines are capable of processing a *lot* of food.
2. Other equipment may need to be upgraded to avoid bottlenecks.
3. An IQF machine should fit into and complement existing business strategy.
4. Getting IQF set up is both complicated and costly.

See page 8 for more detail

Individually quick-frozen broccoli florets ready to be packaged.

THE CHALLENGE

Sustaining local agriculture is at the heart of the WMFPC's mission. It was natural, therefore, that when a local farmer asked the facility to prototype new frozen products in 2010 staff jumped at the chance. The growing farm-to-school movement had many in the community searching for ways to get more Pioneer Valley food into area schools. Blanching and freezing fresh-picked vegetables offered a way to extend the availability of local produce beyond the growing season, add value to farm products, and get local food into school dining halls. Following the success of the product prototyping in 2010, WMFPC staff realized they could have a two-fold impact: supporting local farmers with a good price for their produce and increasing access to local produce for students in area schools. In 2011, the center began buying, processing, and freezing local produce in five-pound bags under the brand *Pioneer Valley Vegetable Ventures*.

Pioneer Valley Vegetable Ventures expanded in 2012 when the program caught the attention of the regional executive chef for Chartwells, the company that manages dining services in many of the K-12 schools in Massachusetts, Connecticut, and New York. The company bought 10,000 pounds of frozen carrots and more than 2,000 pounds of frozen broccoli and peppers, and was set to expand purchases for 2013 more than tenfold when the executive chef left and the company did not expand their purchasing. The WMFPC, having set expectations with farmers, still bought and processed 40,000 pounds of local produce, but was forced to expand sales efforts to other area schools, including private schools and university dining services companies.

Peppers await processing at the WMFPC.

During this process, some of the major drawbacks of the product line came into focus:

1. Frozen five-pound blocks took a significant amount of time to thaw, requiring advanced planning by dining services staff and workflow problems if a block wasn't thawed in time.
2. Because product was only available in five-pound increments, dining services staff weren't able to use small amounts as minor ingredients, resulting in decreased demand and more complex menu planning.
3. The slower freezing that took place using the walk-in freezers resulted in the formation of ice crystals in the produce, increasing cellular damage to the product. This meant more water loss upon thawing and a lower-quality product.

The concept of rapid freezing to enhance product quality dates back to the work of American inventor Clarence Birdseye's work in the 1920s. Today, a variety of systems for rapid freezing are available from multiple manufacturers. Many systems employ either conventional refrigeration technology or cryogenic (very low temperature; typically <-180°C) to freeze products in individual units; these are referred to as individually quick-frozen (IQF) products, and any equipment that produces them as an IQF system.

Chartwells had raised the idea of shifting to IQF for the *Pioneer Valley Vegetables Venture* in 2012, however it wasn't until after that partnership fell through and the WMFPC began marketing their frozen products to other customers that the idea became a priority.

ADDING AN IQF MACHINE TO THE WMFPC

The market demand for individually-quick frozen produce came at a time that the WMFPC was already poised to make changes to the shared-use kitchen. After three years as an early-morning anchor tenant, Meals on Wheels had elected to move out and build their own dedicated facility. Meals on Wheels had needed significant oven capacity, and had purchased two of their own ovens, allowing other incubator clients to use them in exchange for a lower rental rate. Other users of the kitchen, however, were more interested in sauces and hot-packed liquid products. When Meals on Wheels moved out and took their ovens with them, WMFPC staff saw an opportunity. The space thus freed up would serve as the home of a new IQF machine and several new steam-jacketed kettles. The kettles would be critical to improving the capacity to blanch vegetables prior to freezing in addition to serving the changing demands of other kitchen users. The IQF machine could be sited in a corner; allowing simultaneous use of the prep spaces and large kettle area, key to avoiding lost kitchen rental revenues.

Executive Director John Waite describes the decision as simple; in his words “freezing is the future” and investing to build out the capacity was a logical choice. Of course, the process itself was far from simple. Even after a used unit was identified for a bargain $20,000, nearly $5,000 in repairs were needed to make it operational. The machine, a Martin/Baron Model MBI 1-30-0006-01, was longer and wider than any other equipment in the kitchen; to get it in place required removing two walls. Special vacuum jacketed piping was required to transport the liquid nitrogen safely from the storage tank to the machine, an additional cost of $22,000. Although the storage tank itself is rented from AirProducts, a four-foot rebar-reinforced pad had to be built to hold it, costing another $20,000. Including installation, says Waite, the overall cost of the IQF machine came to approximately $110,000.

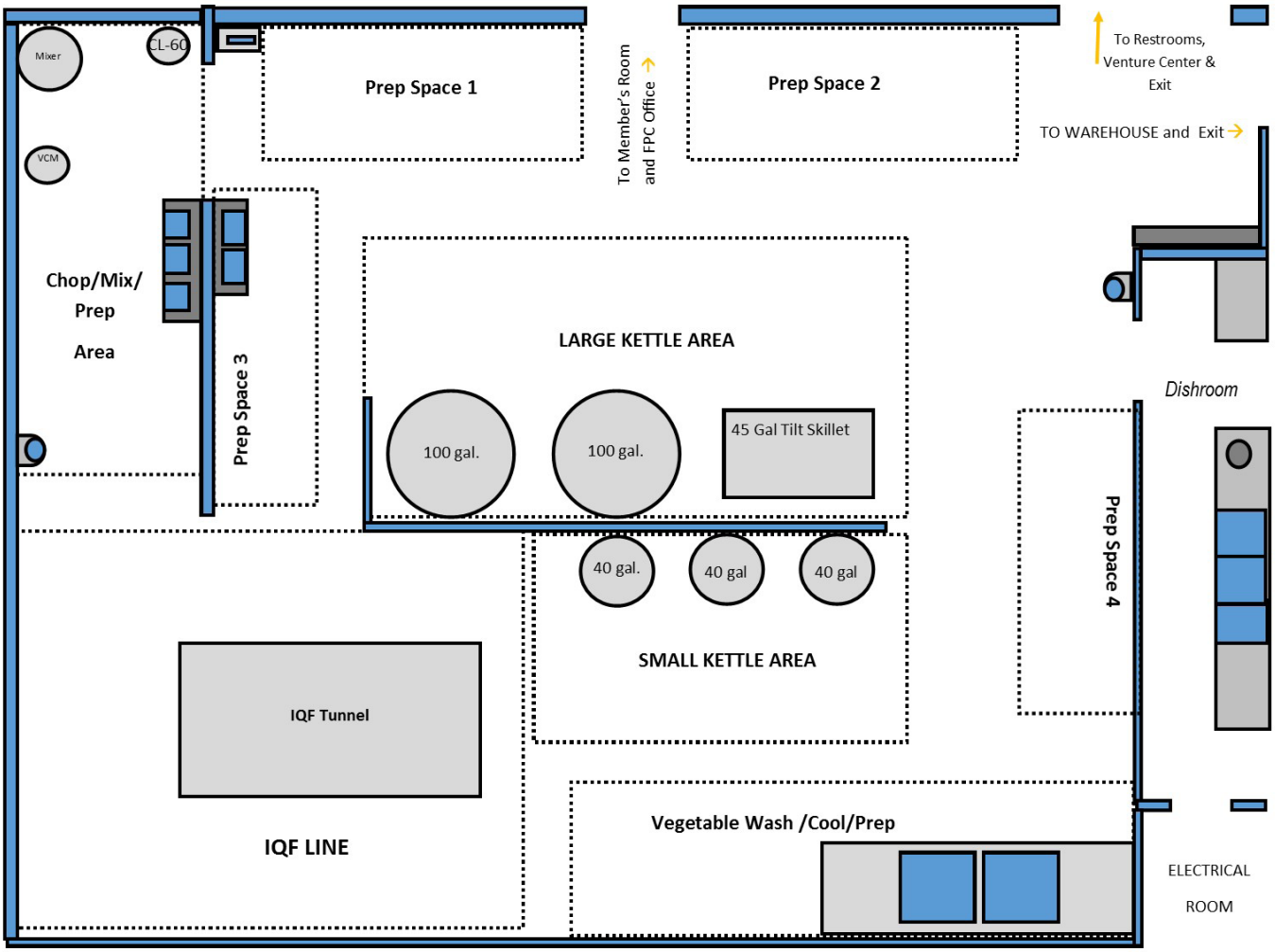
The addition of the IQF machine was rolled up in a broader facility expansion, along with the purchase of other new equipment and construction of larger permanent cold storage space, to replace the mobile units in use since the facility’s inception. A diverse funding stack was assembled to support the expansion (see chart on page five), including money from the Franklin County CDC, prepaid rent, and variety of grants and loans.

The tank that will store liquid nitrogen for the IQF machine is installed at the WMFPC.

ABOUT THE FACILITY

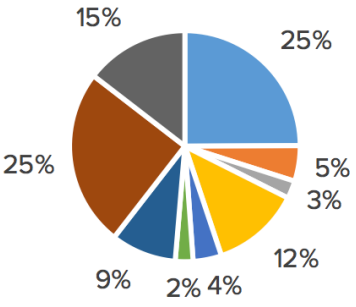
WESTERN MASS FOOD PROCESSING CENTER LAYOUT

(Note: not to scale)



WESTERN MASS FOOD PROCESSING CENTER EXPANSION FUNDING BY SOURCE

($1 million overall)

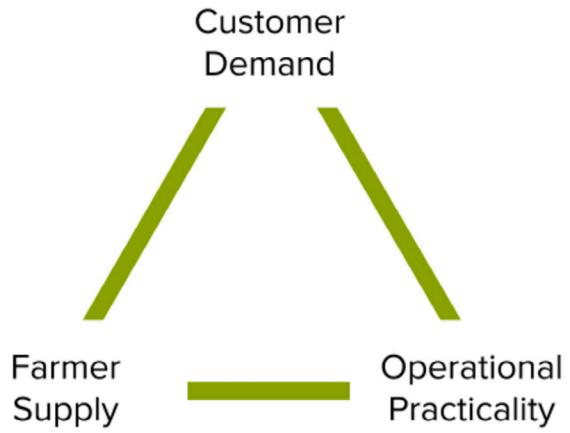


- USDA RD Community Facilities Loan
- USDA RD Community Facilities Grant
- USDA - NIFA Grant
- MA Office of Workforce Dev. Grant
- USDA AMS LFPP Grant
- Pre-paid rent
- FCCDC
- MA Dept. of Ag. Resource Grant
- Pending

IQF AT THE FOOD PROCESSING CENTER TODAY

By the time the IQF machine was installed and fully functional it was late in the fall of 2014. Since then, facility staff have been experimenting with strategies to make the best use of this expensive and unique asset. Due to the lateness of the season, that year only carrots and butternut squash were processed using the IQF machine. Beginning in 2015, WMFPC staff began working with area farms to co-pack select products. Blueberries, strawberries, tomatoes, peppers, and carrots have all been individually quick-frozen for various farms, who have had great success adding frozen offerings to their winter community supported agriculture (CSA) shares and farmers' markets offerings. Starting in 2015, all *Pioneer Valley Vegetable Ventures* products were frozen using the IQF machine. This shift was well-received by customers, who appreciate the convenience and superior quality.

The past two years have been a learning process as the WMFPC staff continues trying to find the right balance between what customers want to purchase, what local farmers are able to produce at a competitive price point, and what the team of eight staff (three full-time and five part-time) members is able to efficiently process. The last consideration, especially has led to some interesting realizations. Broccoli florets, for example,



are in high demand, are grown by numerous area farms and freeze well. The local broccoli available, however, doesn't necessarily conform to the uniform crown size standard that the facility's floretting machine is designed to manage. The result is extensive hand-work, driving up labor costs and making it challenging to meet the price point of institutional purchasers. Similarly, although there is healthy demand for IQF local corn, four separate pieces of equipment would be required to process it efficiently prior to freezing, making it cost-prohibitive at the scale of the WMFPC. Some of the most successful products, in fact, have been developed in partnership with farms that have specialized in a

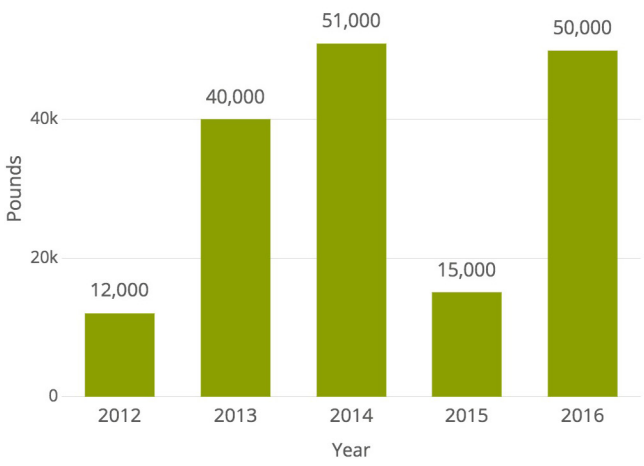
Retail packages of Pioneer Valley Vegetable Venture products for sale at a local grocery store.

particular crop and purchased the necessary equipment to process it on-farm. Snipped green beans, carrot coins and peeled and chopped butternut squash are three examples; in each case the initial processing step happens on-farm and the WMFPC handles freezing and packaging.

As the WMFPC staff has gained experience with the IQF machine, a number of tools, tricks, and "rules of thumb" have been developed. First and foremost are the HACCP plans developed by operations manager Liz Buxton for each IQF product. These are a critical component of ensuring the safety of the *Pioneer Valley Vegetable Venture* product line, and a key part of how the facility complies with FDA regulations. Given the expense of operating the machine (approximately 10 cents per pound of product, primarily driven by the cost of liquid nitrogen) an additional charge of $50 per hour of freezing is necessary for use of the IQF machine. Because it takes approximately one-half hour to reach operating temperature and two person-hours to clean post-operation, the team has also learned that running the IQF machine for less than four hours at a time is rarely worth the expense, leading to a four hour minimum for users. With a throughput capacity of approximately 500 pounds per hour, that means minimum product runs of at least 2,000 pounds. The speed of freezing has prompted several changes in the *Pioneer Valley Vegetable Venture* production process. Upstream, a $30,000 dicer and the additional blanching kettles were necessary to ensure a steady supply of ready-to-freeze product. Downstream, the staff continues to package and move product to frozen storage by hand. The labor cost and potential loss of

ANNUAL PRODUCTION VOLUME

Pioneer Valley Vegetable Venture



The IQF machine, a Martin Baron Model MBI 1-30-006-01, in place at the WMFPC shared-use kitchen.

quality if product isn't moved to storage quickly enough are ongoing challenges and two reasons the long-delayed build-out of additional frozen storage remains a priority.

> *"We work with farmers; they can put things on a truck and drive it all the way to Boston and they'll only take the pretty ones. They can drive it five to 20 miles here, and we'll take it all, same price. It's better for the farmers, and the produce stays here [in the Pioneer Valley]. It's part of the whole system that's going on here in the valley, and it's such a great, great, thing."*
>
> ***– Liz Buxton, Manager, Western Massachusetts Food Processing Center***

Despite the expense and challenges, WMFPC staff are positive about the impact of the IQF machine and bullish about the future of the *Pioneer Valley Vegetable Venture*. Local vegetables are reaching local schools in increasing numbers, far more local farmers are using the facility now than ten years ago, and the five-person production team works nearly full-time during the harvest season. The approximately 50,000 pounds processed in 2016 was enough to cover the cost of production. While production volumes aren't yet at the desired level of 200k-300k pounds per year, the addition of a one-pound retail pack offering, currently underway, is expected to help raise margins. Overall, the greater facility utilization that has resulted from the ability to offer an IQF service is helping keep the WMFPC both financially sustainable and a vibrant piece of the local food system.

KEY TAKEAWAYS

1 Even small IQF machines are capable of processing a lot of food.

For the investment in such an expensive piece of equipment to pay off requires substantial use. To make this happen means having both a significant supply of local produce for processing and unmet demand for IQF product or services. The WMFPC staff plans on a 100-mile radius sales area. Pre-sales to institutions assure demand and working agreements with farmers that set target volumes ahead of time help assure supply. This requires significant staff time for marketing and coordination with farmers.

2 Other equipment may need to be upgraded to avoid bottlenecks.

Because operating an IQF machine is relatively expensive, ensuring it runs at full capacity while on is important to managing unit costs. That means sufficient processing capacity upstream (washing, chopping, and blanching) and downstream (packaging). Without the investment in a higher-capacity dicer and additional steam-jacketed kettles, IQF products would cost more to produce at the WMFPC.

3 An IQF machine should fit into and complement existing business strategy.

The WMFPC had already identified light-processing and freezing of local produce as a key activity to deliver on its mission to provide opportunities for sustaining local agriculture. The departure of long-time anchor tenant Meals on Wheels provided the opportunity for a shift. An IQF machine was a unique asset among shared-use facilities in the region, helping the WMFPC differentiate itself. The additional kettles for blanching produce prior to freezing also serve the growing demand from other incubator clients.

4 Getting IQF set up is both complicated and costly.

The equipment is large, specialized plumbing is required, and creating and managing separate HACCP plans for each IQF product requires significant staff support. More importantly, to ensure the costly IQF system is utilized efficiently may require additional equipment or reconfiguration of production processes and storage space.

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