

The background of the slide is a photograph of a large, multi-story stone building with a prominent clock tower on the left. The building has a gabled roof and several arched windows. In the foreground, a group of students is walking across a grassy area with large rocks. The sky is blue with some light clouds.

UMassAmherst
The Commonwealth's Flagship Campus

“New Frozen Products for a New Market”

An Integrated Research-Extension Program Targeted Toward Determining New Market Channels for Local Producers

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**Note: The presented material is preliminary data. Please do not use as reference or distribute.*

Project Team



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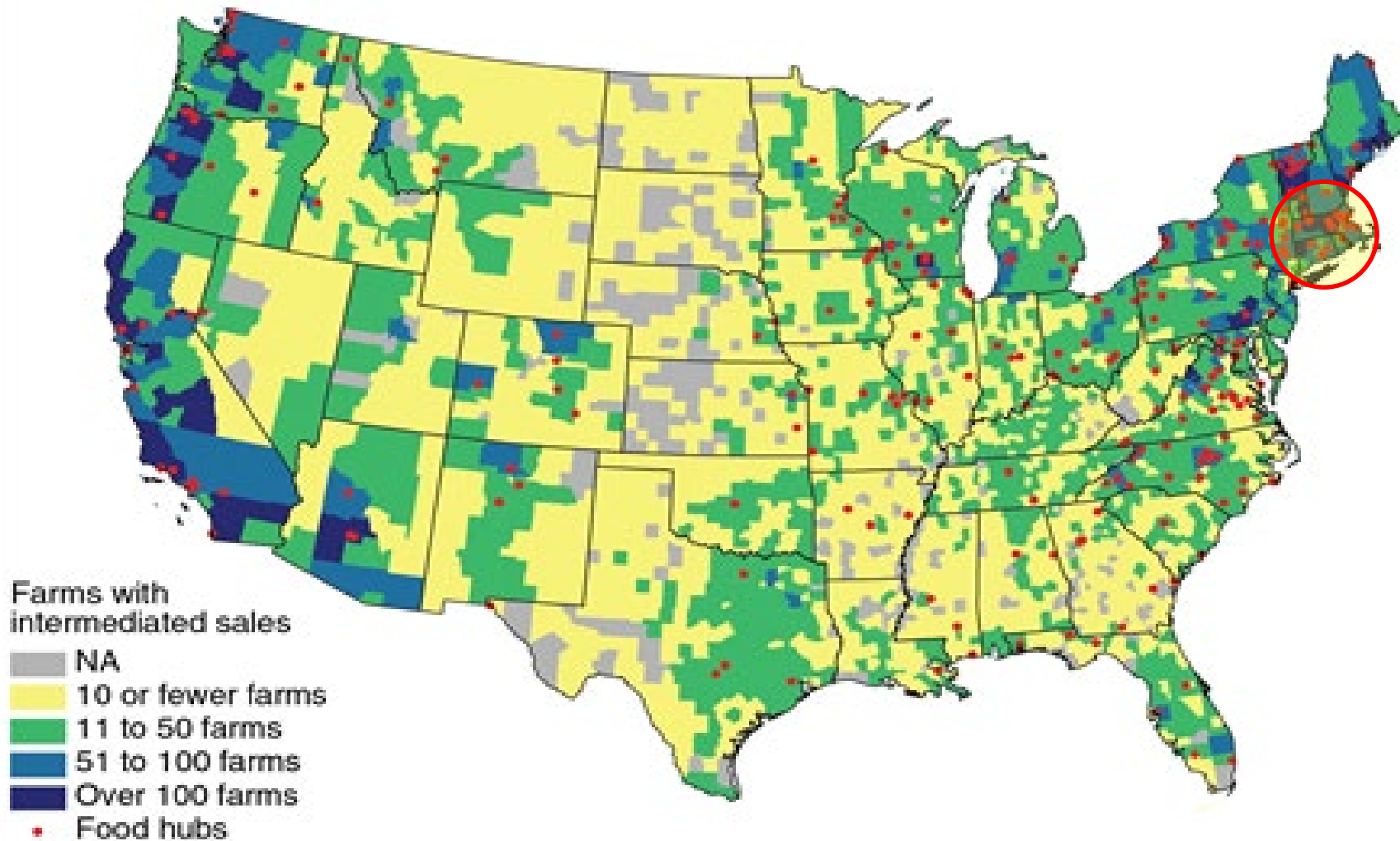
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New Frozen Products for a New Market

Is it feasible, or profitable, to grow and freeze retail packages of frozen fruits and vegetables in New England?



Farms with intermediated sales (2012), by county, and food hubs (2014)



Source: USDA Economic Research Service using data from National Agricultural Statistics Service, Census of Agriculture, 2012 and Agricultural Marketing Service, 2014.

Northeast Food Landscape



- 23,008 produce farms¹
- 6,072 Small/Medium Processor¹
- 79 Food Hubs²
- 84% increase produce farms in the past 10 years³
- 4.9% growth in food processing businesses over the past 9 years¹

1 – Reference USA 2015

2 –NGFN 205

3- USDA NASS 2012

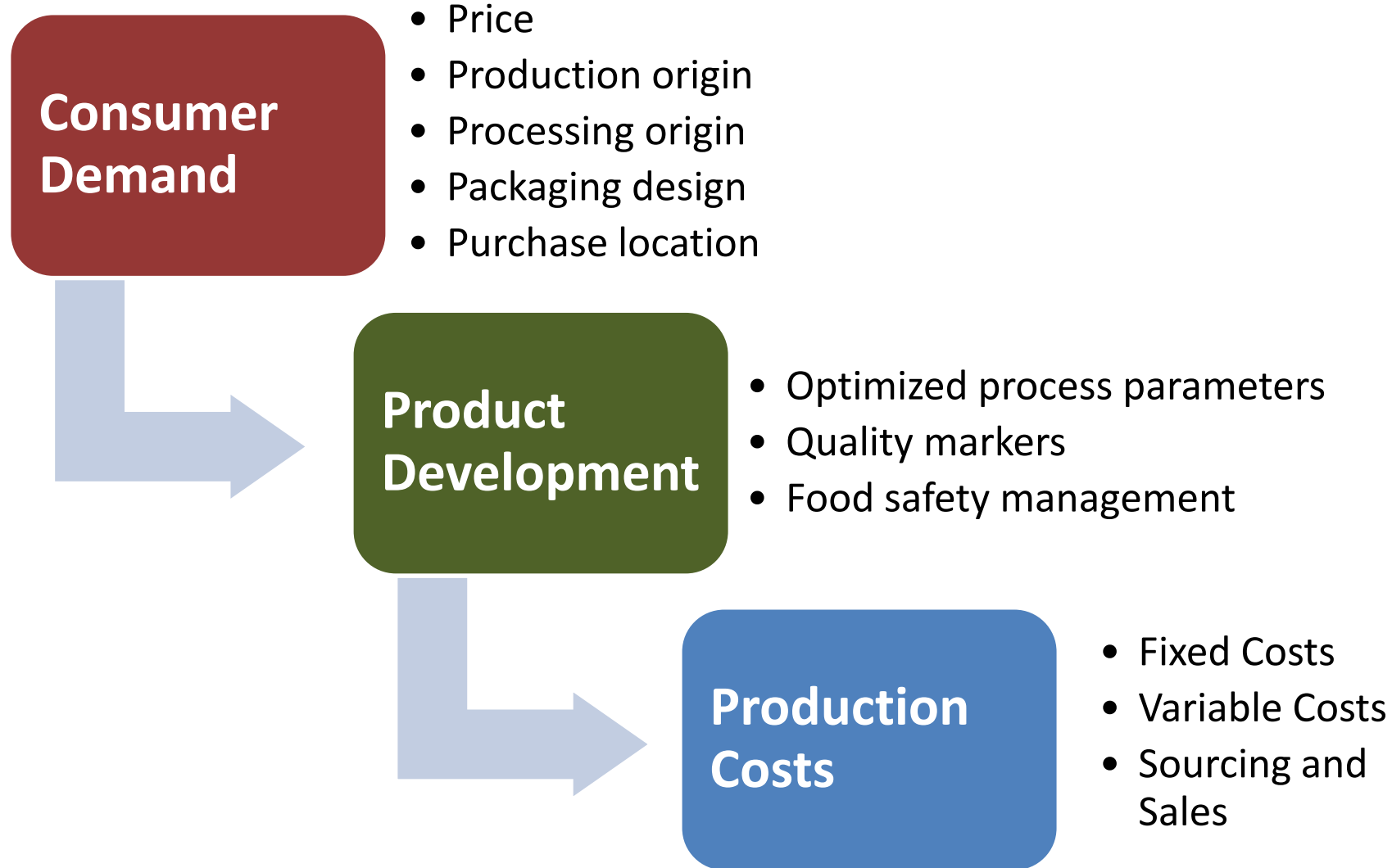
Hypothesis

Local produce can be profitably grown and processed (frozen) for off-season retail sales.



- Consumers have higher *willingness-to-pay* for locally produced and processed frozen foods
- Costs of producing safe, high-quality locally grown and processed frozen foods will not exceed consumers' *willingness-to-pay*.

Key Objectives



Consumer Demand

How Much Will Consumers Pay for Local/ Regional Frozen Products?

TAKE-AWAY: Different Marketing Approaches for
Different Consumers

- “Local Foods” Consumers care most about where they buy frozen “local” products
- “Traditional” Consumers are more price-sensitive

How Much Will Consumers Pay for Local/ Regional Frozen Products?

- What do consumers care about?
- Do they care enough to pay a price premium?
- Is the premium enough to:
 - ✓ Cover production costs?
 - ✓ Pay farmers a premium?
- Who are the consumers?

What do consumers care about?

We tested the following product characteristics:

- Where the product is grown
- Where the product is frozen
- Where they buy it
- How much they pay
- What the package looks like

Choose your preferred option :

Option 1

Price **\$7.50**

Package



Grown **in the USA**

Frozen **in the USA**

Bought From **Direct from Farmer (Farmers Market, Farm Share, Farm Stand)**

Option 2

Price **\$3.75**

Package



Grown **in the Northeast**

Frozen

Bought From **Supermarket (Chain or Independent that sells only food)**

Option 3

Price **\$5.60**

Package



Grown

Frozen **in the USA**

Bought From **Supermarket (Chain or Independent that sells only food)**

None of these options

Choose your preferred option :

PRICE →

5 Variations:

\$3.75

\$4.75

\$5.60

\$6.55

\$7.50

Option 1

Price \$7.50

Package



Grown in the USA

Frozen in the USA

Bought From Direct from Farmer (Farmers Market, Farm Share, Farm Stand)

Option 2

Price \$3.75

Package



Grown in the Northeast

Frozen

Bought From Supermarket (Chain or Independent that sells only food)

Choose your preferred option :

PACKAGE →

4 Variations

- Clear Bag
- White Bag
- Printed Label
- Sticker Label

Option 1

Price **\$7.50**

Package 


Grown **in the USA**

Frozen **in the USA**

Bought From **Direct from Farmer (Farmers Market, Farm Share, Farm Stand)**

Option 2

Price **\$3.75**

Package 

Grown **in the Northeast**

Frozen

Bought From **Supermarket (Chain or Independent that sells only food)**

Choose your preferred option :


4 Variations:

- Local
- In the Northeast
- In the USA
- (no info)

GROWN →

Option 1

Price **\$7.50**

Package 


Grown **in the USA**

Frozen **in the USA**

Bought From **Direct from Farmer (Farmers Market, Farm Share, Farm Stand)**

Option 2

Price **\$3.75**

Package 

Grown **in the Northeast**

Frozen

Bought From **Supermarket (Chain or Independent that sells only food)**

Choose your preferred option :

4 Variations:

- Local
- In the Northeast
- In the USA
- (no info)

FROZEN →

Option 1

Price **\$7.50**

Package 


Grown **in the USA**

Frozen **in the USA**

Bought From **Direct from Farmer (Farmers Market, Farm Share, Farm Stand)**

Option 2

Price **\$3.75**

Package 

Grown **in the Northeast**

Frozen

Bought From **Supermarket (Chain or Independent that sells only food)**

Choose your preferred option :


4 Variations:

- Direct from Farmer (Farmers Market, Farm Share, Farm Stand)
- Supermarket (Chain or Independent that sells only food)
- Super Store ("Big Box" store that offers large household goods)
- Cooperative Grocer (Food Co-op)

BOUGHT →

Option 1

Price **\$7.50**

Package 


Grown **in the USA**

Frozen **in the USA**

Bought From **Direct from Farmer (Farmers Market, Farm Share, Farm Stand)**

Option 2

Price **\$3.75**

Package 

Grown **in the Northeast**

Frozen

Bought From **Supermarket (Chain or Independent that sells only food)**

Returns from Product Sales: How much will consumers pay for a frozen retail product?

Who took part in this experiment?

Two Consumer Groups

1. “Traditional Consumer” – New England primary household shoppers
 - Purchased sample of 500 respondents
 2. “Local Foods Consumer”
 - Sent to 3 mailing lists of local foods consumers ~250 responses
- Demographics

Determining Consumer Preferences:

- How “important” are different characteristics?

	<i>Rank of Importance</i>				
<i>Consumer Group</i>	<i>1st</i>	<i>2nd</i>	<i>3rd</i>	<i>4th</i>	<i>5th</i>
"Traditional" Group	Price	Where Bought	Package	Grown	Frozen
"Local" Groups 1 & 3	Where Bought	Price	Grown	Frozen	Package
"Local " Group 2	Where Bought	Price	Frozen	Grown	Package

How Much Will Consumers Pay for Local/ Regional Frozen Products?

TAKE-AWAY: Different Marketing Approaches for
Different Consumers

- “Local Foods” Consumers care most about where they buy frozen “local” products
- “Traditional” Consumers are more price-sensitive

Research & Development

R&D

- **Activity:** Process Optimization
- **Method**
 - Bench top screening trials (washing, blanching, dwell time, temp)
 - Scale up at FPC
- **Result/ Outputs**
 - Non-proprietary SOPs for shared-use
 - Food safety plan
 - Process to support Obj 3 (cost & return)



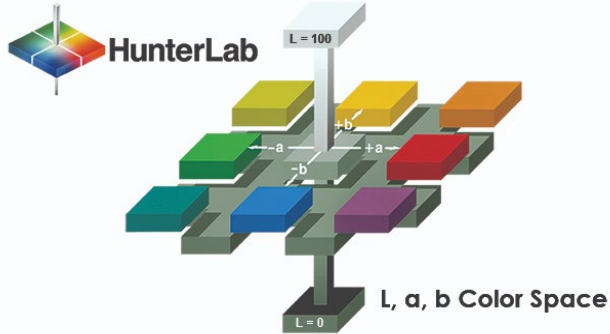
Plant Trial I

	Dwell Times:	Temperatures	
		Temperature A (-120°F)	Temperature B (-140°F)
Trial A	Dwell Time 1 (2m, 30s)	A-150s-120F	A-150s-140F
	Dwell Time 2 (3m, 00s)	A-180s-120F	A-180s-140F
Trial B	Dwell Time 1 (2m, 30s)	B-150s-120F	B-150s-140F
	Dwell Time 2 (3m, 00s)	B-180s-120F	B-180s-140F
Trial C	Dwell Time 1 (2m, 30s)	C-150s-120F	C-150s-140F
	Dwell Time 2 (3m, 00s)	C-180s-120F	C-180s-140F

- NOTES:
- 3 samples will be pulled from each trial at the beginning, middle and end
 - Proposed temperature and dwell time were confirmed by Aug 14th based on final bench top analysis
 - Samples should be pulled in random order.
 - Post-production material can be used for sales and distribution



Quality Attributes



<https://images.app.goo.gl/FeGDjZuwq2oY2PaF6>



<http://stablemicrosystems.com.cn/taxtplus.htm>

- Appearance (photo images)
- Berry Damage
- Color (L^* a^* b^*)
- Drip Loss
- Texture Analysis
- Polyphenol Content

Appearance

150s, -120F



180s, -140F

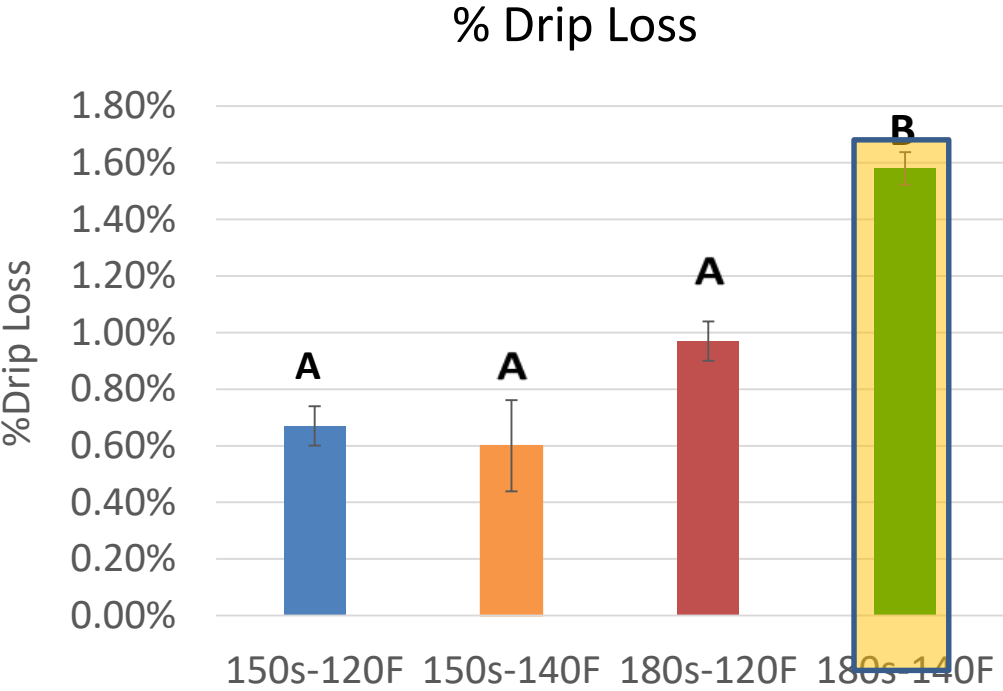
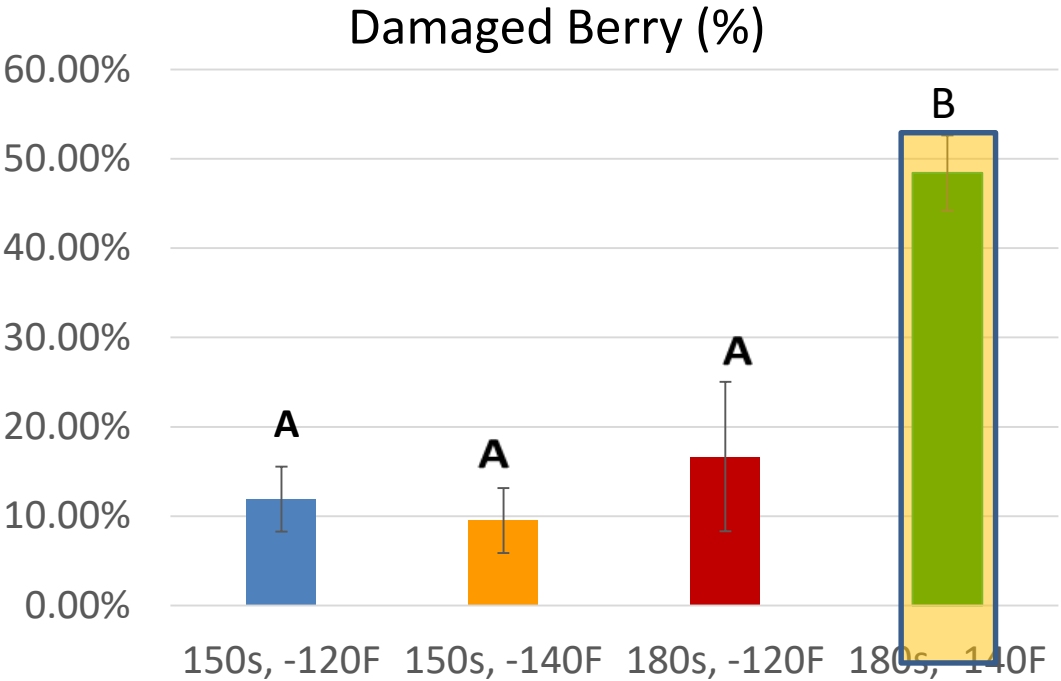


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180s, -140F



Blueberry Quality: Different Processing Conditions



Recommended Process Condition: 150seconds at -120°F

Sampling regime: Three trials (A,B,C), within each trial four variants (2min 30s, 3min, -120F, -140F), samples pulled at beginning (1 min), middle (3min) and end (5min) of production
Link to Data: <https://umass.app.box.com/file/525949301285>

Plant Trial 2

General Analysis & Shelf Life Results

- Trial was conducted on 8/23/19 and looked at:
 - One temperature and time used- 150s, 120 ° F
- Four Different Storage Conditions:
 - Consumer (6.62°F), Commercial(-5.62°F), Retail (-20.74°F), and Wholesale Storage Conditions (-20.74°F)
 - Retail and Wholesale are stored in the same freezer but have different packaging. Wholesale the berries are loose in a cardboard box. Retail berries have been vacuumed sealed in pouches.



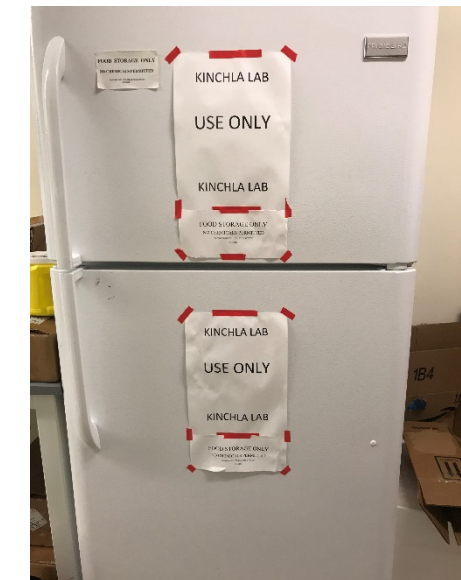
General Analysis (-40°F)



Retail and Wholesale (-20.74°F)

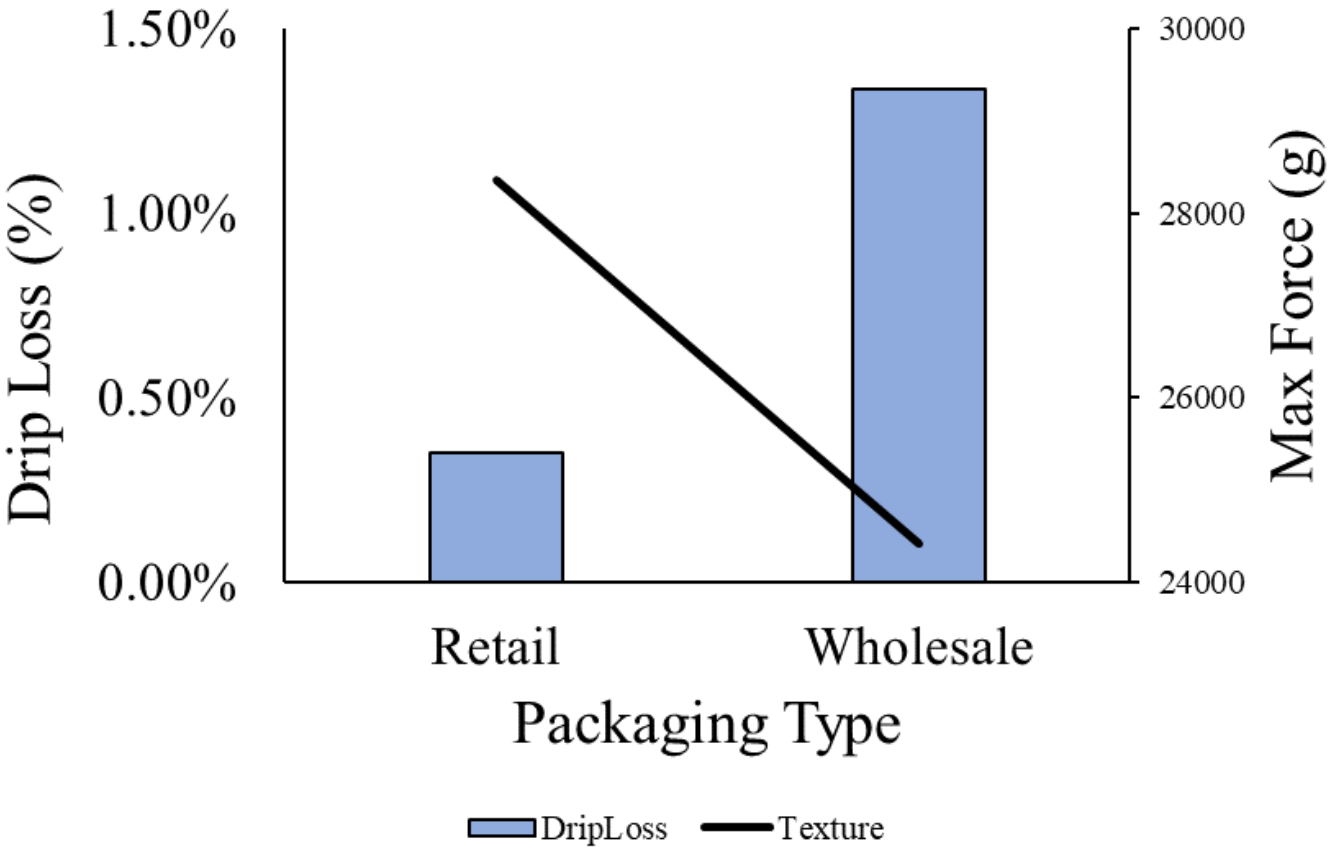


Commercial Freezer(-5.62°F)



Consumer Freezer (6.62°F)

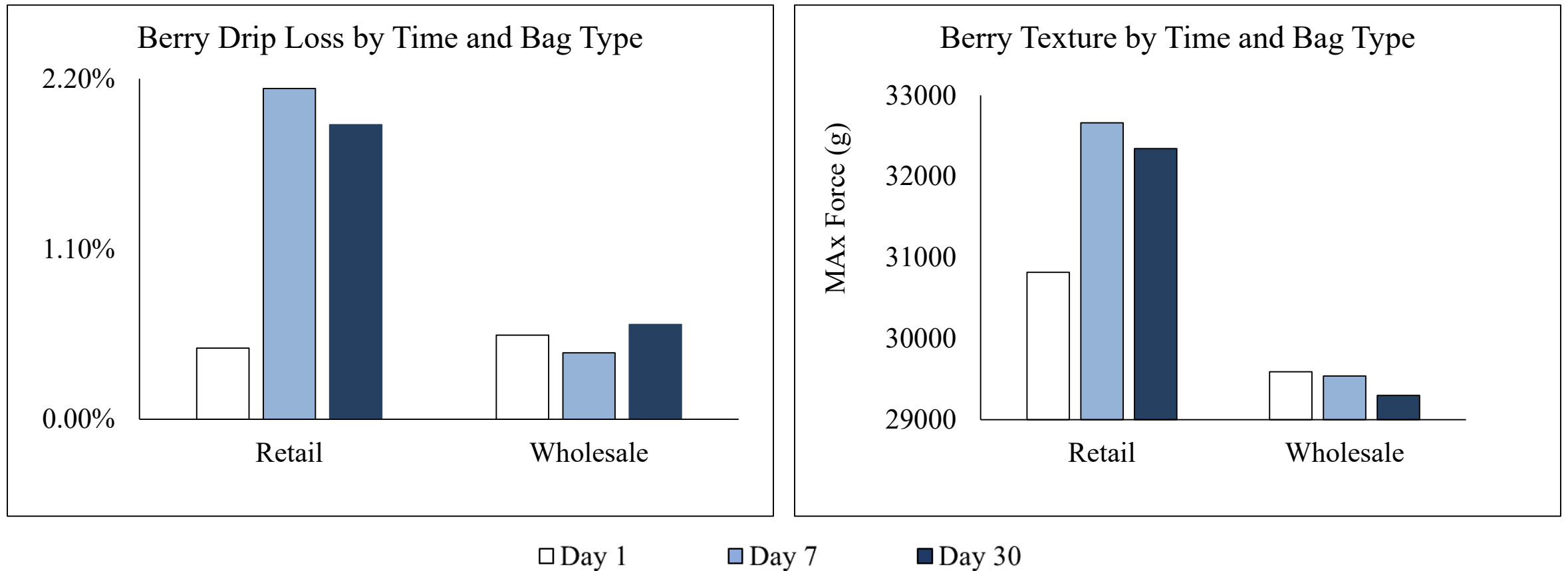
Blueberry Quality by Production Time



One Trial, within trial two different handling methods (Retail, Wholesale). Samples Pulled from line at 15-minute increments plant trail on 8/23/19. Link to Raw Data: <https://umass.app.box.com/file/534976228367>; https://umass.app.box.com/folder/94323089280?utm_source=trans&utm_medium=email&utm_campaign=collab%2Bauto%20accept%20user

Quality of Blueberries

Retail Packages vs. Wholesale Boxes Stored Over Time



One Trial, pulled from storage at 1st day, 7th day and 30th day after plant trail on 8/23/19

Link to Raw Data: <https://umass.app.box.com/file/534585084128>;

https://umass.app.box.com/folder/94323089280?utm_source=trans&utm_medium=email&utm_campaign=collab%2Bauto%20accept%20user

PRELIMINARY DATA: Not for publication or distribution.

Blueberry R&D Next Steps

- Continue additional analysis on blueberry for phenolic content, anthocyanin, vitamin C.
- Continue to conduct shelf-life up to 6 months
- Complete food safety plans, planned for January



Cost/Returns



PRELIMINARY DATA: Not for publication or distribution.

Processing Costs: How much does it cost to process local frozen blueberries?

Key Questions:

1. What are costs of a day of production?
2. What are the costs of operating a freezing-capable processing facility?
3. What are costs of managing the frozen retail product line?

$COSTS = \underline{[Processing Costs + Distribution Costs + Retail Mark-up]}$

In 2020, we will use Cost data to estimate Budgets for different scale scenarios.

Returns from Product Sales:

What price can you charge in the market place?

How much can you sell at that price?

Key Questions:

1. What characteristics does the final product have?
2. What market are you aiming for?
3. Are there enough of your target consumers?

RETURNS = PRICE x QUANTITY SOLD

In 2020, we will use Consumer Demand data to estimate projected Price and Quantity Sold

Supply Chain Costs and Returns from Retail Frozen Product

Is it feasible to process frozen local products for the retail market?

Returns from Product Sales – Costs = Feasibility

What about Profitability? (For whom?)

Outreach Activities



- 1 hour webinar: Fall 2020
- Face to Face workshops: Fall 2020
- UMass Vegetable Extension “Vegetable Notes Newsletter”

Acknowledgments

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Supply Chain Costs and Returns from Retail Frozen Product

Is it feasible to process frozen local products for the retail market?

Feasibility = Returns from Product Sales – [Processing Costs + Distribution Costs + Retail Mark-up]

- We measure : 1) Returns from Product Sales; 2) Processing Costs
- We use rules-of-thumb to estimate: 1) Distribution Costs; 2) Retail Mark-up

Returns from Product Sales: How much consumers are willing to pay for local frozen retail blueberries.

Processing Costs: How much it costs to process local frozen blueberries and spinach.

This Project:

- Address key elements of a market for processed local product
- What are **consumer preferences** for locally grown and locally processed blueberries?
- How do these **preferences affect the retailer, processor and farmer?**
- Retailer – are consumers willing to pay for these products and how should they be presented (**consumer preferences**: packaging and pricing)?
- Processor – what are the **processing costs** for locally grown/locally processed products? Trials to determine **optimal processing parameters**. Can consumer preferences be met?
- Farmers – given **consumer preferences** and **processing costs**, are they willing and able to provide berries to the processor?

Returns from Product Sales: How much will consumers pay for a frozen retail product?

Key Questions:

1. What product characteristics are most important to consumers?
2. What product characteristics are most critical for production decisions?
3. What product characteristics are unique to local frozen retail?
 - That is, what characteristics have not already been studied in existing research?
4. Which consumers do we care most about?/ Who are the consumers?

Returns from Product Sales: How much will consumers pay for a frozen retail product?

Key Questions:

1. What product characteristics are most important to consumers?

- Where the product is grown
- Where the product is frozen
- Where the product is purchased
- What is the price of the product
- What the product package looks like
- What the product label looks like

Returns from Product Sales: How much will consumers pay for a frozen retail product?

Key Questions:

2. What product characteristics are most critical for production decisions?

- What is the price of the product
- What the product package looks like
- What the product label looks like

Returns from Product Sales: How much will consumers pay for a frozen retail product?

Key Questions:

3. What product characteristics are unique to local frozen retail? What characteristics **HAVE ALREADY** been tested in the literature?
 - Organic vs. Local
 - Local vs. No origin information

Determining Consumer Preferences:

Willingness to Pay Study – Consumer Survey Data

Next Steps

- Clean data
- Estimate consumer willingness to pay
 - Statistically different responses between 4 samples?
 - Statistically different responses between Qualtrics and Local samples?
 - Statistically different responses between Where Bought?
- Write papers + reports

Processing Costs: How much does it cost to process local frozen blueberries and spinach?

1. What are costs of a day of production?

- Dependent on available equipment, management, labor, etc.
- Variable Input costs
 - Ingredients (blueberries/ spinach)
 - Labor
 - Materials (packaging)
 - Sanitation inputs (hair nets, Sanidate, etc.)
 - Freezing inputs (nitrogen, electricity, etc.)
- Methods of measurement – fixed and variable inputs?
- Time-track a day of production (August 2019 & July 2020)

Processing Costs: How much does it cost to process local frozen blueberries and spinach?

1. What are costs of a day of production?

- How much does it cost to process local frozen blueberries and spinach?
- How to measure – contributions and costs of management staff – unique relationship between CDC and FPCC.
 - E.g., Estimate Business Development Specialist role - Begun last year, need to re-visit now that Kate is on board

Processing Costs: How much does it cost to process local frozen blueberries and spinach?

2. What are the costs of operating a freezing-capable processing facility?

- In this project, need to include both the FPC and the FCCDC costs.
- Staff costs, overhead, building and equipment costs, etc.

3. What are costs of managing the frozen retail product line?

- Costs of sourcing, arranging delivery, coordinating distribution and sales
- Separated by task

Distribution Costs and Retail Mark-up

- We use rules-of-thumb to estimate: 1) **Distribution Costs**; 2) **Retail Mark-up**
- Next steps:
 - Review spreadsheets provided by FCCDC Accountant, develop list of follow-up questions, work with FCCDC to identify costs
 - Ask Eric, Sarah, Jeremy, and Suzette for assistance estimating these costs.

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