Strawberry Budgeting and Economics

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Strawberry Agent Training, Dec 16, 2020

Overview

- Overview of NCSU's strawberry budget
- Changes in key parameters for 2020
- Strawberry seasonal price movements
- Review of consumer and market intermediary preferences

Budget status

- NCSU's Strawberry budget last fully updated in 2015
  - U-pick and pre-pick
- U Georgia has a 2020 strawberry budget
  - Wholesale
- U Arkansas's strawberry budget is no longer online

Key assumption updates

- Interest on operating capital: 2.7%
  - FSA operating loans at 1.25%
- Labor rate: $12.67/hour (H2A Adverse wage rate for NC)
- Farmer, Rancher, Agricultural Manager median wage rate: $34.21/hour (Bureau of Labor Statistics)
- Diesel price: $2.5
- Gas price: $2 (AAA Gas Prices)

Owner labor

- Used in
  - Irrigation
  - Preplant fumigation
  - Scouting
  - Freeze protection

  - The $34.21/hour rate is likely too high
  - It is not a ‘large’ component of total cost

Navigating the budget

- Red tabs have assumptions you can change
- Change the values in the blue cells to update the estimated costs and returns

Key Assumptions

Marketing Assumptions:

Plants/acre		15,000		
Projected Marketable Yields		1.20	pounds/plant	
		18,000	pounds/acre	
		3,000	4qt buckets/acre	
Harvest week 1		10.0%	1,800	pounds/acre
Harvest week 2		15.0%	2,700	pounds/acre
Harvest week 3		25.0%	4,500	pounds/acre
Harvest week 4		20.0%	3,600	pounds/acre
Harvest week 5		15.0%	2,700	pounds/acre
Harvest week 6		15.0%	2,700	pounds/acre
U-Pick		40.0%	7,200	pounds/acre
	Price	$10.00	/4qt basket	
		$1.67	/pound	
Pre-Pick		60.0%	10,800	pounds/acre
	Price	$12.00	/4qt basket	
		$2.00	/pound	

Selected Input prices:

Production Labor			
	Owner Expense	$16.85	/hour
	Employee Expense	$12.76	/hour
Harvest Labor Cost		$1.15	/4qt basket
4qt Harvest Basket		$0.75	/each
Gasoline price		$2.00	/gal
Diesel price		$2.50	/gal

Loan Interest Rate	2.70%
Insurance Rate	1.00%
Tax Rate	1.00%

Summary costs and returns

Estimated Returns per Acre			
Marketable yield		**18,000**	**lbs/acre**
U-pick	40%	7,200	lbs/acre
Pre-pick	60%	10,800	lbs/acre
Market price			
U-pick		1.67	$/lb
Pre-pick		2.00	$/lb
Gross revenue		**33,600.00**	**$/acre**
Production costs		**19,232.20**	**$/acre**
Equipment		1,396.96	$/acre
Materials		10,389.31	$/acre
Labor		7,304.93	$/acre
Administrative and taxes		141.00	$/acre
Net revenue		**14,367.80**	**$/acre**

Summaries by month and stage of production

Monthly Cost Estimates

Month	Equipment Costs	Material Costs	Labor Costs	Total Costs	Percent Total
June	115.57	73.40	352.18	$541.15	2.81%
July	0.00	0.00	0.00	$0.00	0.00%
August	31.31	0.00	38.28	$69.59	0.36%
September	456.67	4,817.43	804.98	$6,079.07	31.61%
October	48.66	211.30	78.20	$338.16	1.76%
November	10.89	145.45	9.95	$166.29	0.86%
December	11.54	1,333.60	392.75	$1,737.89	9.04%
January	0.00	0.00	586.96	$586.96	3.05%
February	34.89	401.09	516.81	$952.79	4.95%
March	310.34	493.66	746.06	$1,550.06	8.06%
April	255.10	950.76	1,099.74	$2,305.61	11.99%
May	121.99	1,962.61	2,679.03	$4,763.62	24.77%
Annual Charges	0.00	0.00	0.00	$141.00	0.73%
Total per Year	**$1,396.96**	**$10,389.31**	**$7,304.93**	**$19,232.20**	**100.00%**

Cost Estimates for Stages of Production

Stage	Equipment Costs	Material Costs	Labor Costs	Total Costs	Percent Total
Land Preparation	115.57	73.40	352.18	$541.15	2.81%
Pre-Plant	226.83	1,367.43	322.65	$1,916.91	9.97%
Trans-Plant	320.70	3,806.75	608.76	$4,736.21	24.63%
Dormant	11.54	1,333.60	1,073.12	$2,418.26	12.57%
Pre-Harvest	564.00	1,159.79	1,364.24	$3,088.04	16.06%
Harvest	158.32	2,648.34	3,583.98	$6,390.63	33.23%
Annual Charges	0.00	0.00	0.00	$141.00	0.73%
Total per Year	**$1,396.96**	**$10,389.31**	**$7,304.93**	**$19,232.20**	**100.00%**

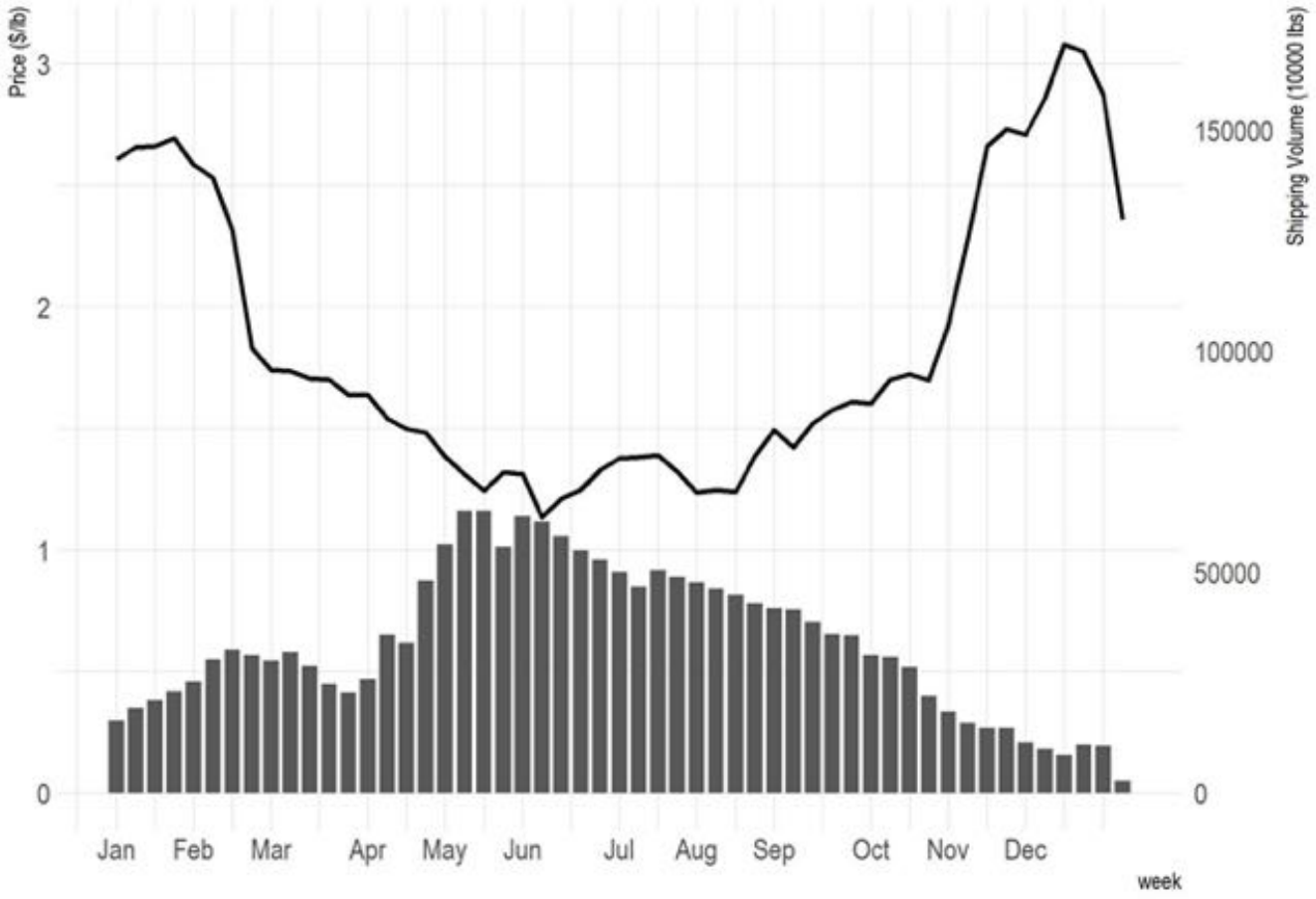
Caution: The production system is not editable

- The spreadsheet is locked
  - I am searching for the unlocked version

- The production sequence cannot be altered
  - No changes to spray program
  - Cannot be used for partial budgeting

Strawberry Seasonal Price Movements

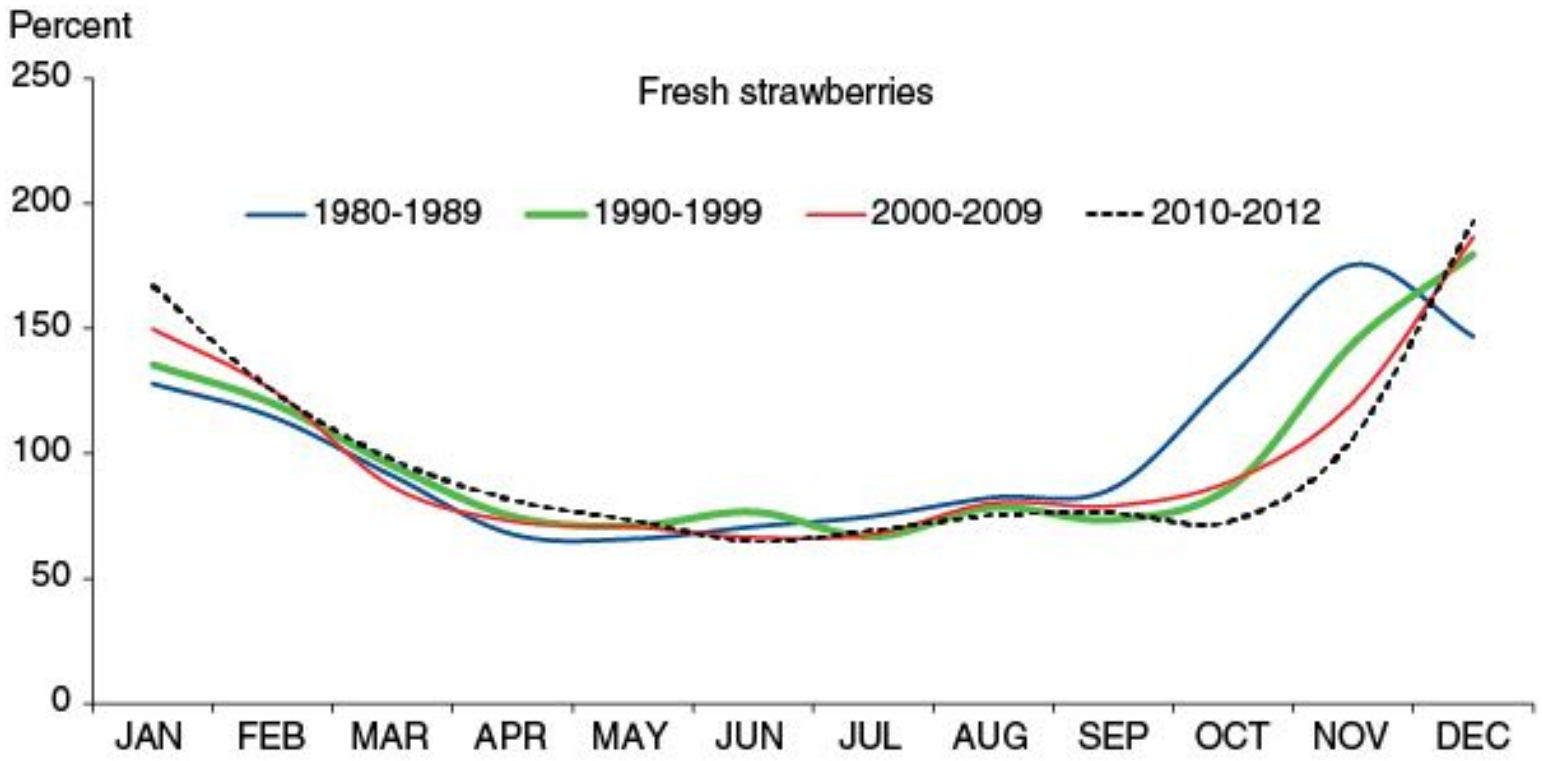
National strawberry shipping point prices are highly seasonal



Average shipping point price and volume (2016--20). Source: USDA AMS

The seasonality of strawberry prices has a long history

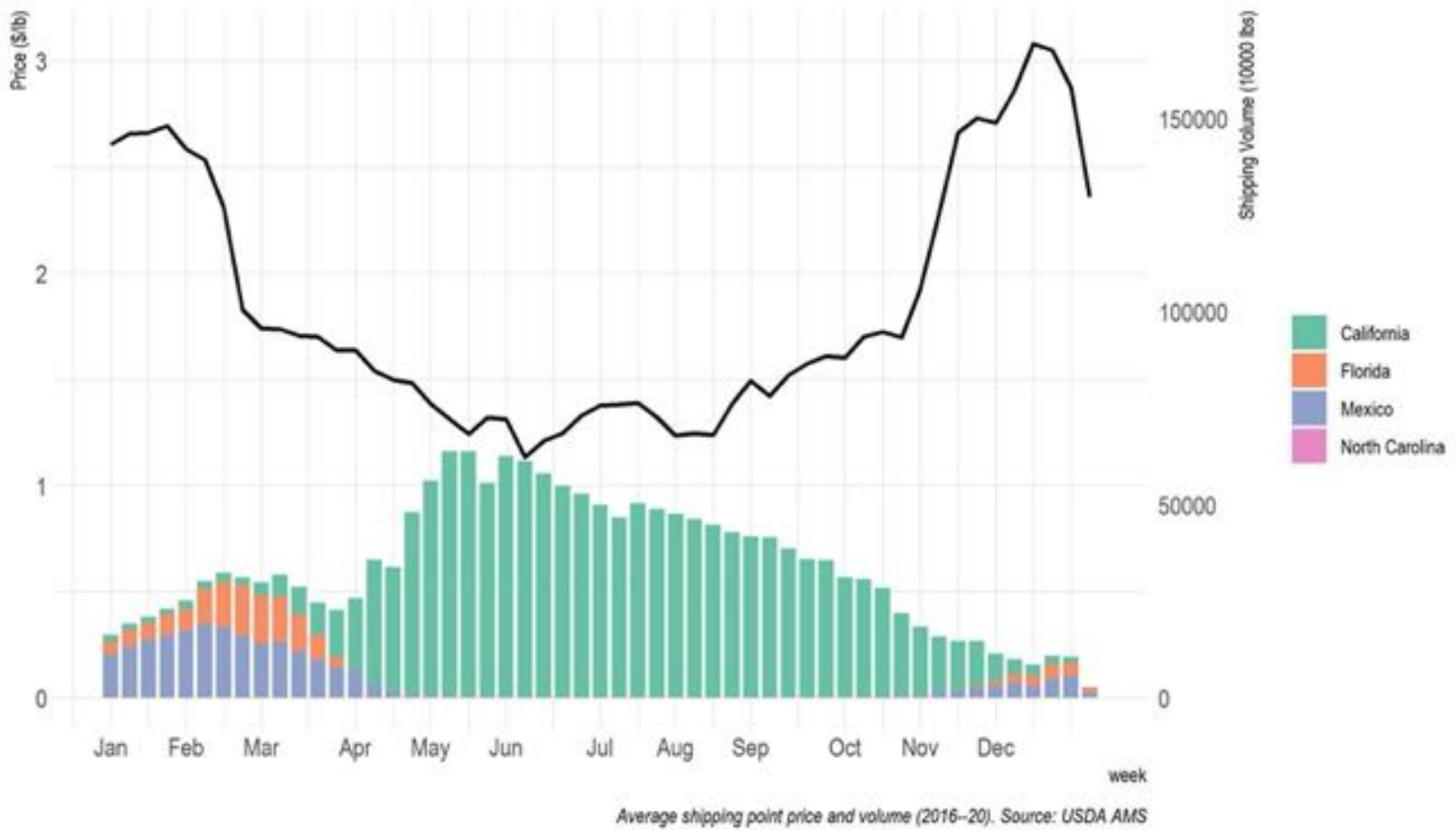
Seasonal prices are distinct for fresh strawberries



Note: Seasonal averages were computed from fresh grower prices for apples and strawberries, with a centered moving average that removes trend, cyclical, and random price movements, leaving only seasonal price movements. The calculated mean will approach 100 when monthly index values are averaged for a given year.
Source: USDA, Economic Research Service analysis using USDA, National Agricultural Statistics Service agricultural prices, 1979-2013.

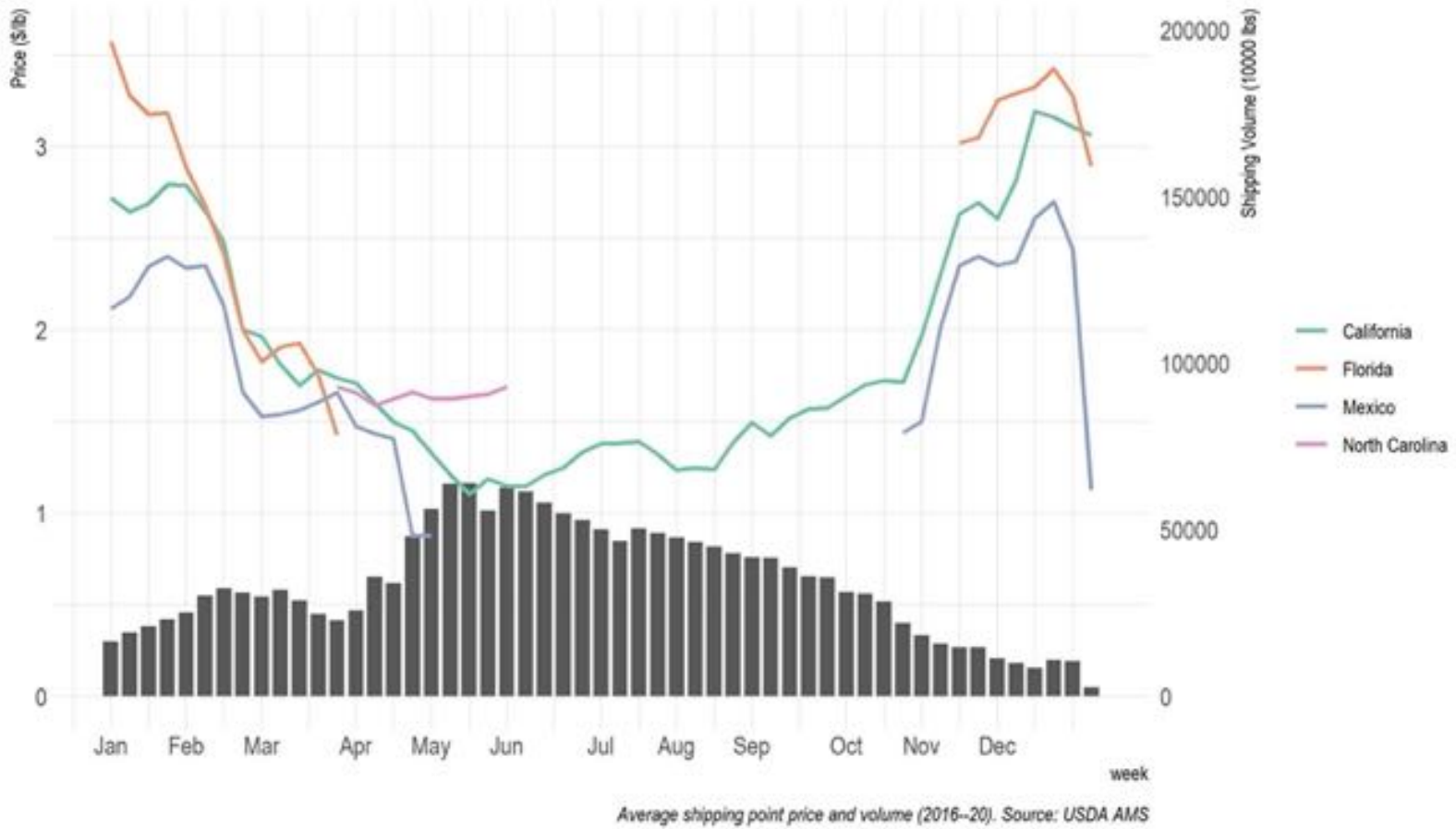
Link to report

NC has a very small presence in the national market



Average shipping point price and volume (2016--20). Source: USDA AMS

NC's shipping prices are stable within our season



Average shipping point price and volume (2016--20). Source: USDA AMS

Consumer and Market Intermediary Preferences for Strawberry Attributes

Summaries of two studies

- Gallardo et *al.* (2015) *Market Intermediaries' Willingness to Pay for Apple, Peach, Cherry, and Strawberry Quality Attributes*

- Wang et *al*. (2017) *What Consumers Are Looking for in Strawberries: Implications from Market Segmentation Analysis*

Gallardo et *al.* (2015)

- 22 completed surveys received from strawberry market intermediaries (packers, shippers, wholesalers)
- Respondents chose between eight scenarios with six quality attributes
  - Size
  - Internal color
  - External Color
  - Firmness
  - Flavor
  - Shelf life
- Logistic regression used to calculate respondents willingness-to-pay for improvements in each attribute

Example choice

Quality trait	Option A:	Option B:	Option C:
External appearance-Free from defects	Less than 3% defects per lot	More than 3% defects per lot	Neither Option
Crispness	Not crisp	Very crisp	
Firmness	More than 14 lbs.	Less than 14 lbs.	
Flavor (Combination of sweetness, sweet/tart balance and aroma)	Full/intense flavor	Weak/mild flavor	
Size	Less than 2.9 inches (100count)	More than 2.9 inches (100count)	
Shelf life at retail	Good (More than 1 week)	Poor (Less than 1 week)	
Total cost of production/storage/handling	$25 /carton (42 lbs.)	$15 /carton (42 lbs.)	
Which option would you choose?	☐	☐	☐

Figure 1 Example of a Survey Scenario for Fresh Apple

Calculated willingnesses-to-pay for fresh strawberries

Market intermediaries were willing to pay:

- $0.24/lb to improve flavor from weak/mild to full/intense
- $0.15/lb for an improvement in firmness from soft to firm
- $0.10/lb for an increase in size from less to more than 25 g/fruit.

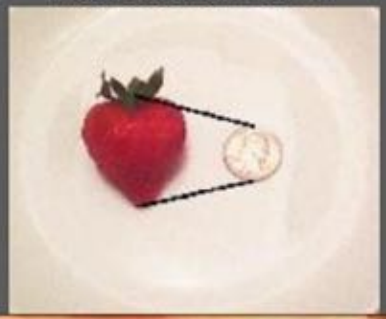
These preferences are consistent with consumer preferences and grading standards

- The WTP results are consistent with findings in previous studies where flavor, sweetness, size, and firmness were found to positively impact consumers' preferences for strawberries
- Firmness and size are both attributes considered in the US standards for grades of strawberries, which commands markets prices and thus impacts intermediaries' profitability.

Wang et *al.* (2017)

- National survey of 1062 consumers
- 36% of respondents were in the South
- Respondents chose between eight scenarios with six quality attributes
  - Size
  - Internal color
  - External Color
  - Firmness
  - Flavor
  - Shelf life
- Two price levels were included:
  - $2.65/lb
  - $2.99/lb

Example choice

	Option A	Option B	Neither Option A or B
the External color is	You are in the supermarket and see these strawberries: 	You are in the supermarket and see these strawberries: 	Neither Option A or B
the Size is	Most strawberries in the clam shell are the size as shown below ... 	Most strawberries in the clam shell are the size as shown below ... 	
the Internal color is			
the Texture is	Firm	Soft	
the Flavor is	Mild strawberry flavor	Intense strawberry flavor	
the Shelf life at home is	Will last 9 days at home in your refrigerator	Will last 4 days at home in your refrigerator	
the Price is	$2.99/lb	$2.65/lb	

Methods

- The study used a latent class logit model to determine whether there were distinct groups of consumers and for each group, determine preferences
- Using three groups explained the data best
  - Balanced consumers
  - Experience attribute sensitive consumers
  - Search attribute sensitive consumers

Balanced consumers

- Around 2/3 of respondents
- Found all six attributes important
- Were sensitive to price
- More likely to:
  - Be in the 35-54 year old age cohort
  - To have income above $25,000
  - To have children

Experience Attribute Sensitive Consumers

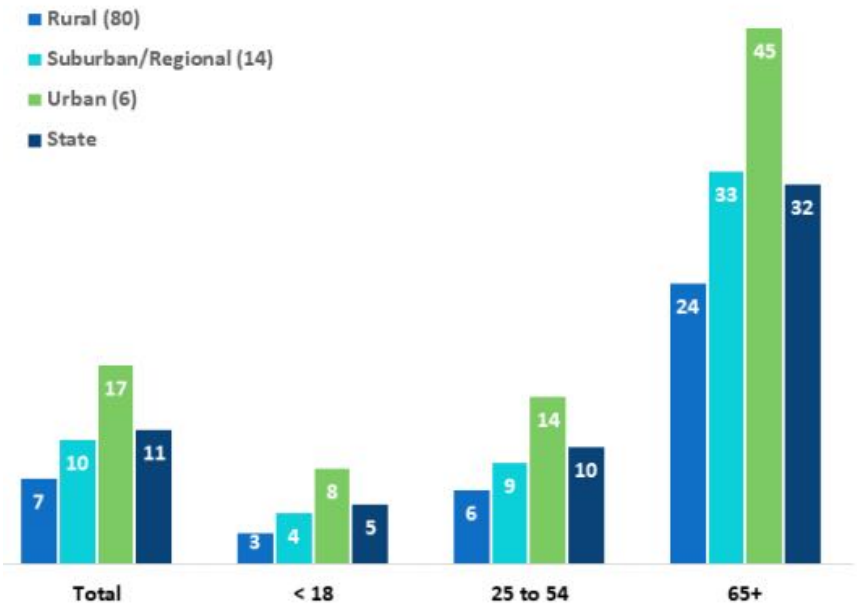
- Strongly prefer intense strawberry flavor, good internal color, and longer shelf-life
- Not price sensitive
- They are:
  - 80 percent Caucasian
  - 74 percent female
- More likely to
  - Eat strawberries regularly
  - Have higher household income
  - Be in the younger age cohort (18-34)

Search Attribute Sensitive Consumers

- Care most about external color, firmness, size
- Sensitive to price
- More likely to:
  - Be 55 years old or older
  - Have income less than $25,000
  - Be non-caucasian

The older population is expected to increase rapidly

Figure 3
More Rapid Growth of Older Adult Population in Urban Areas
Projected Percent Change of Selected Age Groups, 2020-2030

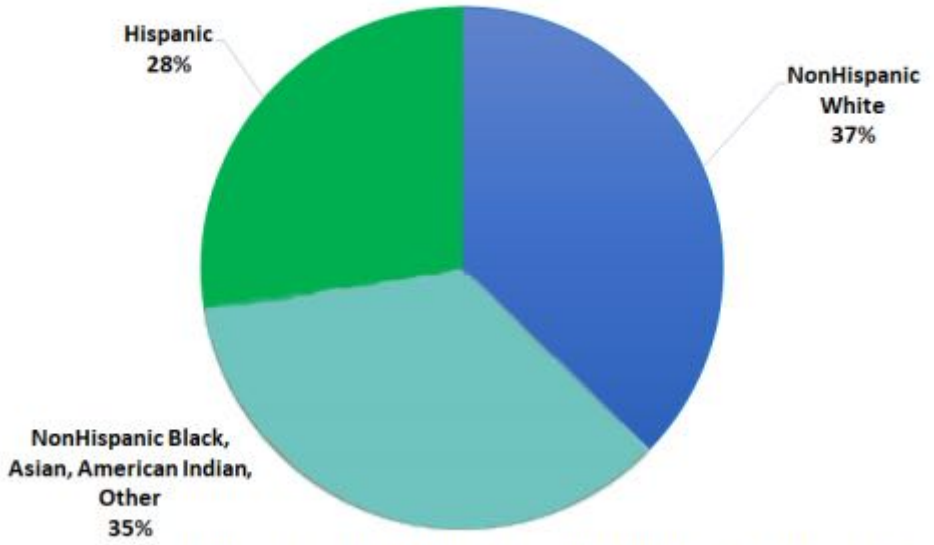


Source: NC OSBM Population Projections, Vintage 2019

Link to report

NC is becoming more racially diverse

Figure 4
Five of Every Eight People Added Now -2039 will be a Person of Color
Proportion of Population Growth Attributed to Each Group, 2020 - 2039



Source: NC OSBM Population Projections, Vintage 2019

Link to report

Take-aways

- Marketing strategies aimed at experience sensitive consumers are likely to be most profitable.
  - Emphasize freshness
  - Provide samples
- Search attribute sensitive consumers are likely to be more numerous in the future.