



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

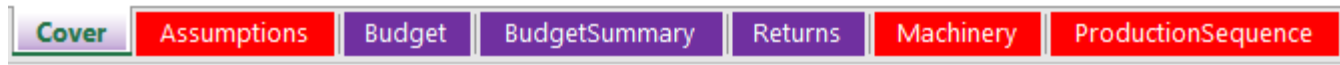
Key assumption updates

- 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%

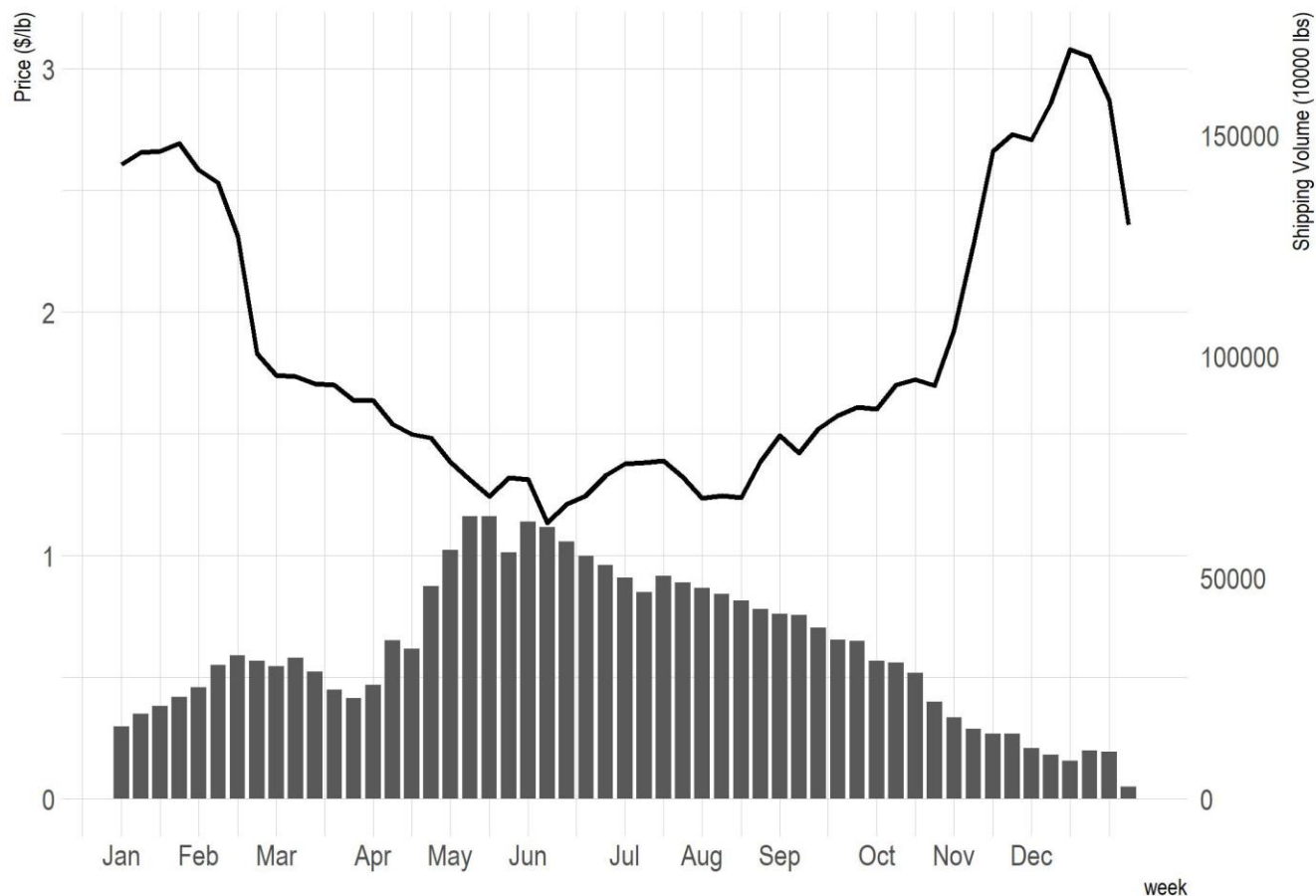
Cost Estimates for Stages of Production					
Stage	Equipment Costs	Material Costs	Labor Costs	Total Costs	Percent Total
Land Preparation	115.57	73.40	352.18	\$541.15	2.81%
Pre-Plant	226.83	1,367.43	322.65	\$1,916.91	9.97%
Trans-Plant	320.70	3,806.75	608.76	\$4,736.21	24.63%
Dormant	11.54	1,333.60	1,073.12	\$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

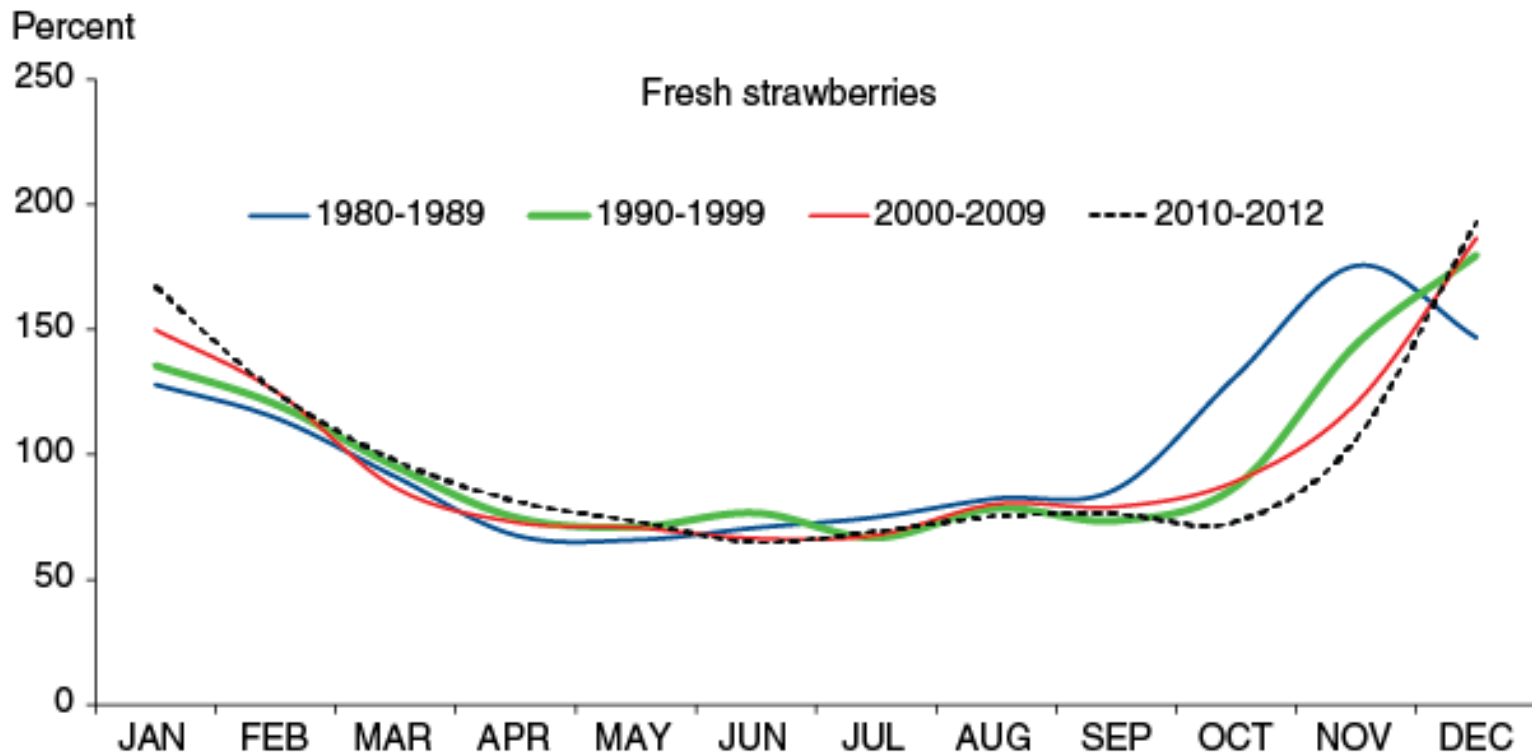
National strawberry shipping point prices are highly seasonal



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

The seasonality of strawberry prices has a long history

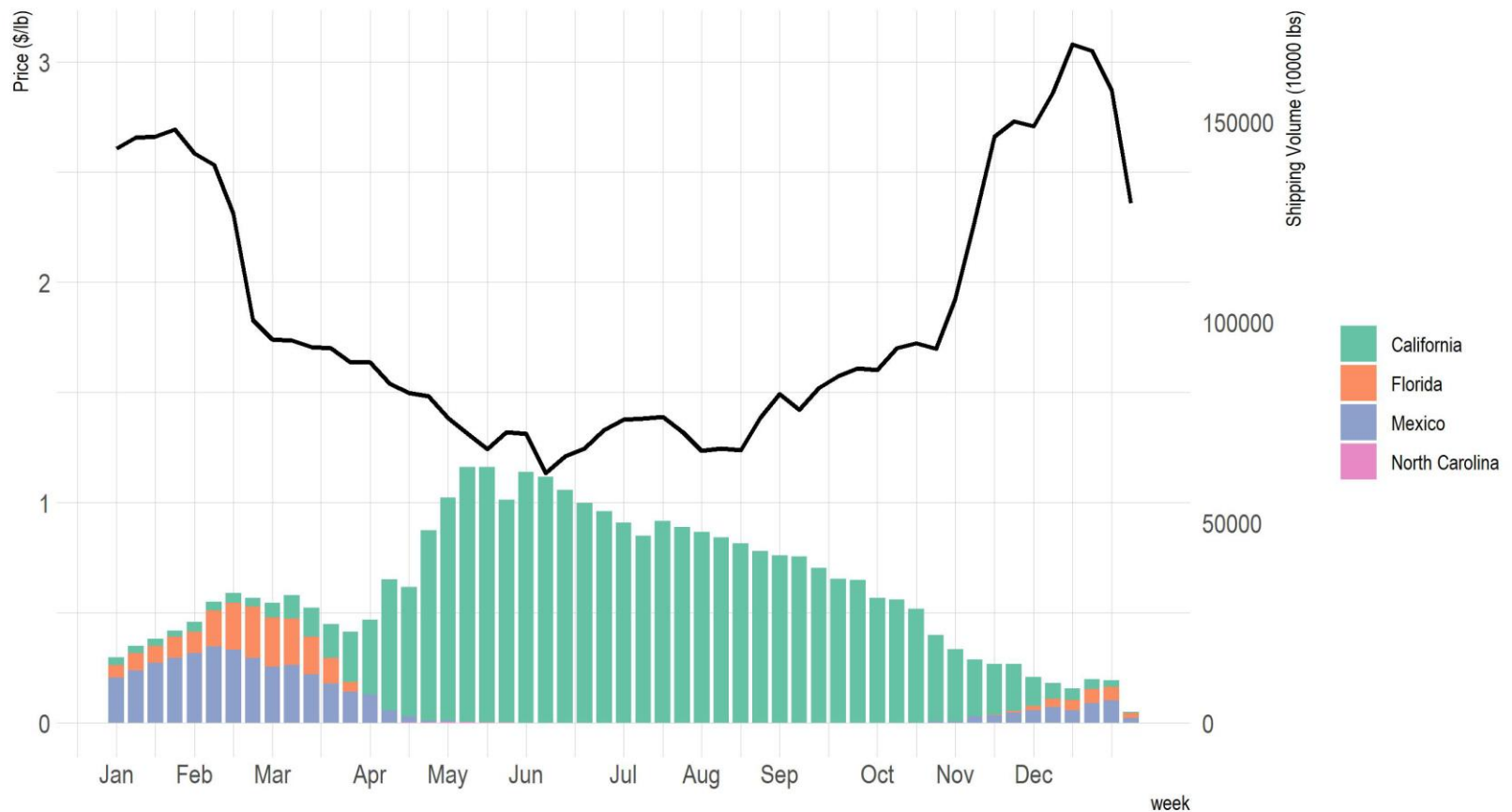
Seasonal prices are distinct for fresh strawberries



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.

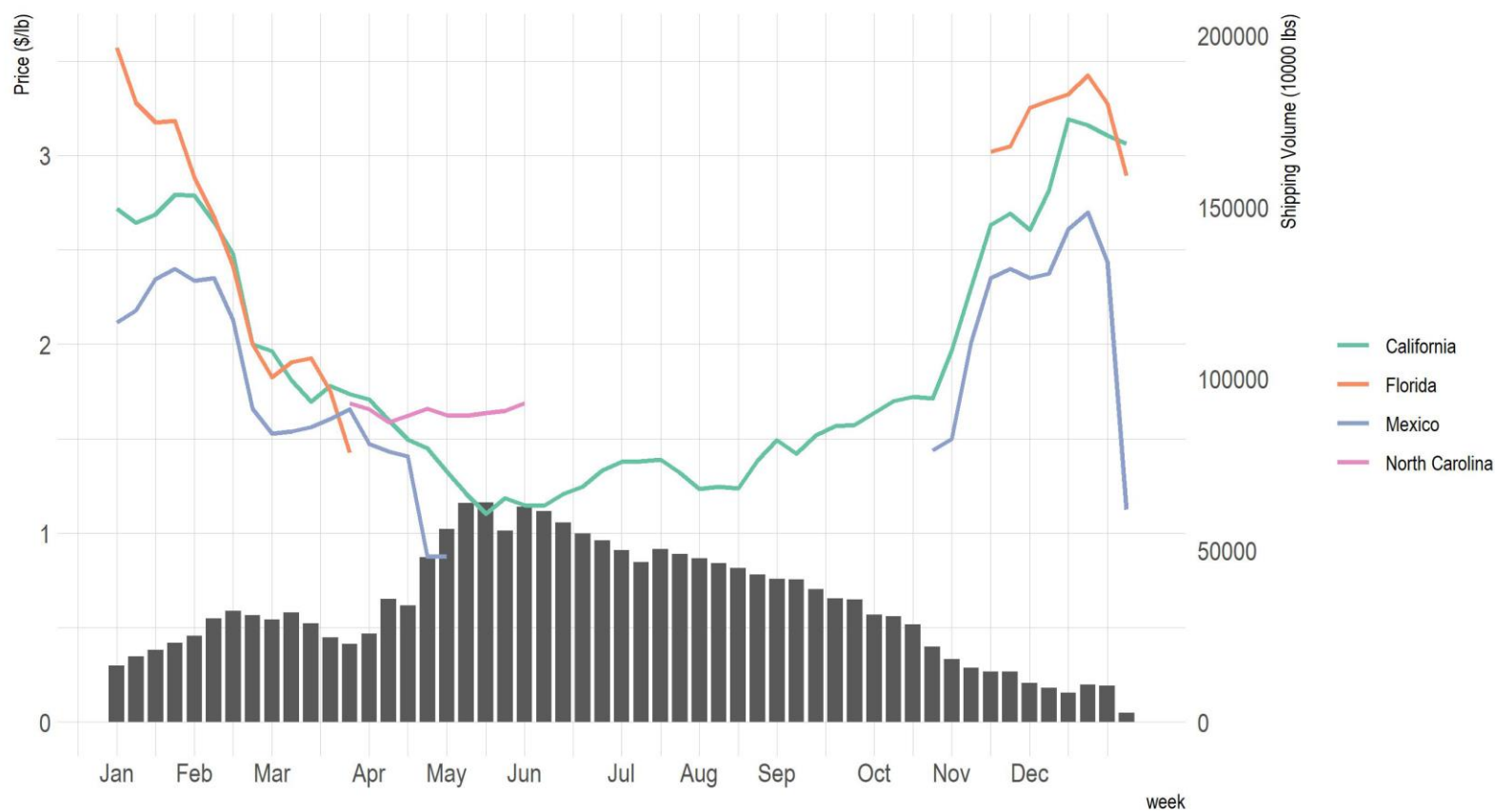
Source: USDA, Economic Research Service analysis using USDA, National Agricultural Statistics Service agricultural prices, 1979-2013.

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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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.




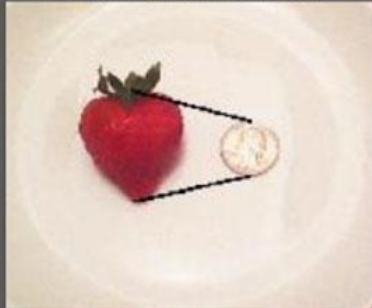


These preferences are consistent with consumer preferences and grading standards

- 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	<p>You are in the supermarket and see these strawberries:</p> 	<p>You are in the supermarket and see these strawberries:</p> 	Neither Option A or B
the Size is	<p>Most strawberries in the clam shell are the size as shown below ...</p> 	<p>Most strawberries in the clam shell are the size as shown below ...</p> 	
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

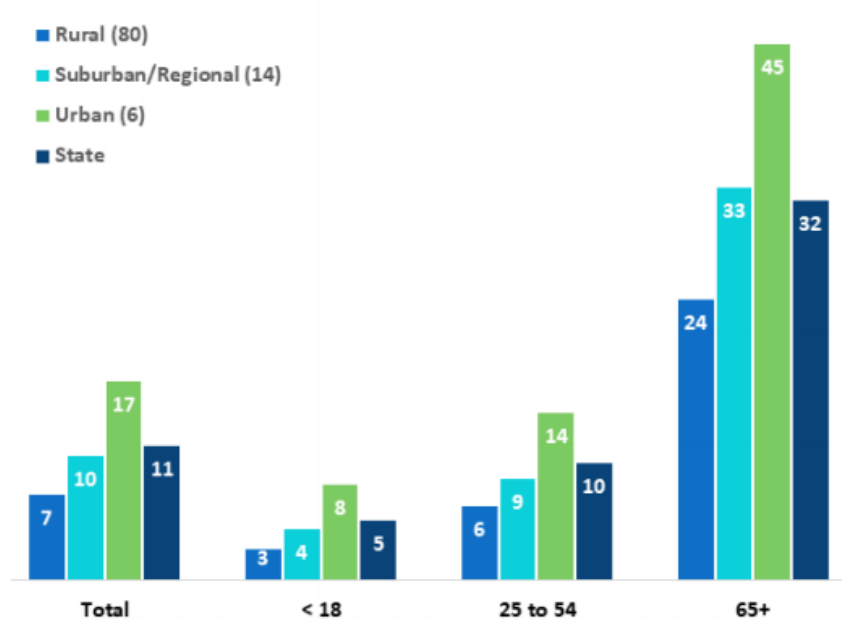
- Strongly prefer intense strawberry flavor, good internal color, and longer shelf-life
- Not price sensitive
- They are:
 - 80 percent Caucasian
 - 74 percent female
- More likely to
 - Eat strawberries regularly
 - Have higher household income
 - Be in the younger age cohort (18-34)

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

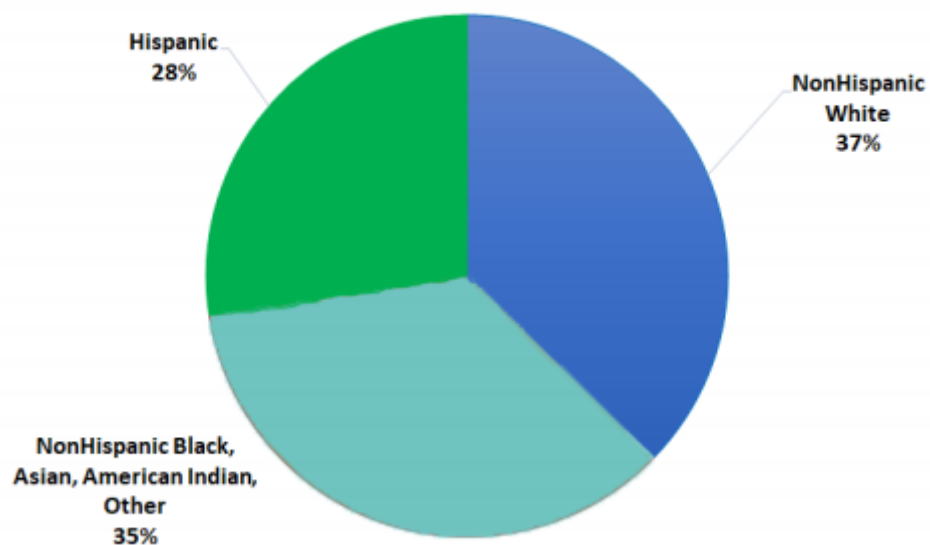
Figure 3
More Rapid Growth of Older Adult Population in Urban Areas
Projected Percent Change of Selected Age Groups, 2020–2030



Source: NC OSBM Population Projections, Vintage 2019

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

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.