Is the harvest over when the price drops? Deciding to stop when there's still a crop

NC STATE UNIVERSITY

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We already know:

Material	Rate/ Acre	Unit	Cost/ Unit	Cost/ Acre	Cost/	Annual Cost
Fumigant						
Chloroplicrin	150.00	lbs	$3.25	$487.50		$487.50
Total Fumigants						$487.50
Fertilizers & Nutrients						
10-20-10	750.00	lbs	$0.17	$127.50		$127.50
20-20-20	1.00	lbs	$0.83	$0.83		$0.83
Calcium nitrate (applied daily, monthly rate)	336.96	lbs	$0.25	$84.24	3.00	$252.72
Potassium nitrate (applied daily, monthly rate)	168.48	lbs	$0.75	$126.36	3.00	$379.08
Total Fertilizers & Nutrients						$760.13
Herbicides						
Paraquat	1.50	pt	$5.25	$7.88	2.00	$15.75
Sencor	0.50	lbs	$11.80	$5.90		$5.90
Poast	1.00	pt	$9.87	$9.87		$9.87
Total Herbicides						$31.52
Insecticides						
Thrips Spintor	6.00	oz	$5.250	$31.50	3.00	$94.50
Aphid Dimethoate	0.75	pt	$5.850	$4.39		$4.39
Fruit Worm Asana	6.00	oz	$0.71	$4.26	8.00	$34.08
Total Insecticides						$132.97
Fungicides						
Early Blight Quadris	6.00	oz	$2.71	$16.26	4.00	$65.04
Early Blight Bravo Ultrex	1.50	lbs	$8.17	$12.26	4.00	$49.02
Late Blight Maneb	2.00	lbs	$7.00	$14.00	4.00	$56.00
Late Blight Actiguard	1.00	oz	$50.00	$50.00	6.00	$300.00
Bacterial Kocide 101	3.00	lbs	$5.25	$15.75	8.00	$126.00
Total Fungicides						$596.06

Producing a vegetable crop requires several expensive inputs like land, labor, and chemicals.

Source: Cost of Producing, Harvesting and Marketing Field Grown Tomatoes in the Southeastern United States. (2012)
O. Sydorovych, F. Louws, and C. Gunter

However…

Marketing Assumptions:

Projected Base Yields	96,646	lbs/acre
Marketable		
Percent of Base Yield	80.0%	
Pounds	77,317	
25 lb Boxes	3,093	
Jumbo and XL fruit	33,301	
Large fruit	24,748	
Medium and small fruit	19,078	
Culled		
Percent of Base Yield	20.0%	
Pounds	19,329	
Market Prices $/25 lb Box		
Jumbo and XL fruit	$9.50	
Large fruit	$8.15	
Medium and small fruit	$7.00	
Culled Fruit		
$/Pound	$0.00	

Source: Cost of Producing, Harvesting and Marketing Field Grown Tomatoes in the Southeastern United States. (2012)
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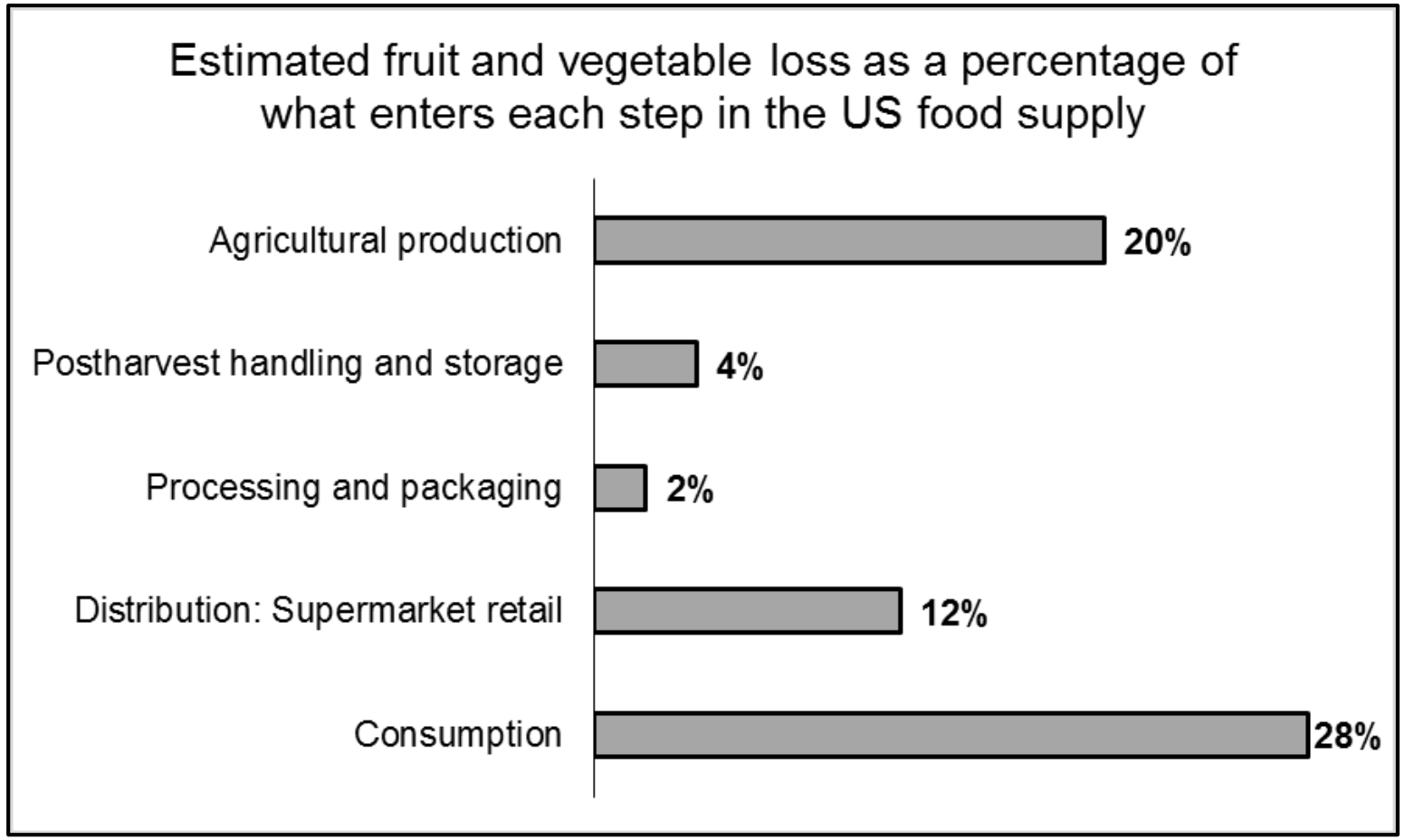
In order to use inputs efficiently,

it makes sense to market everything that is produced,

rather than just what fits traditional buyer specifications.

An estimated 20% of the harvested yield of vegetables is unutilized:
remaining in the field, or culled in packing.



Source: FAO Food and Agriculture Organization of the United Nations. 2011. Global food losses and food waste – Extent, causes and prevention.

Cost of doing business…

… or an opportunity for profit?

What is left in the field after the harvest is ended?

Meets current buyer specifications for quality, but unharvested due to market constraints.

Off-size, blemished, misshapen, or miscolored but not under or over mature. Nutritious and safe.

Damaged, diseased, decayed or over mature. Not suitable for human consumption

Whole Crop Harvest Objectives:

1: Understand decision making, explore strategies that reduce food loss that benefit growers

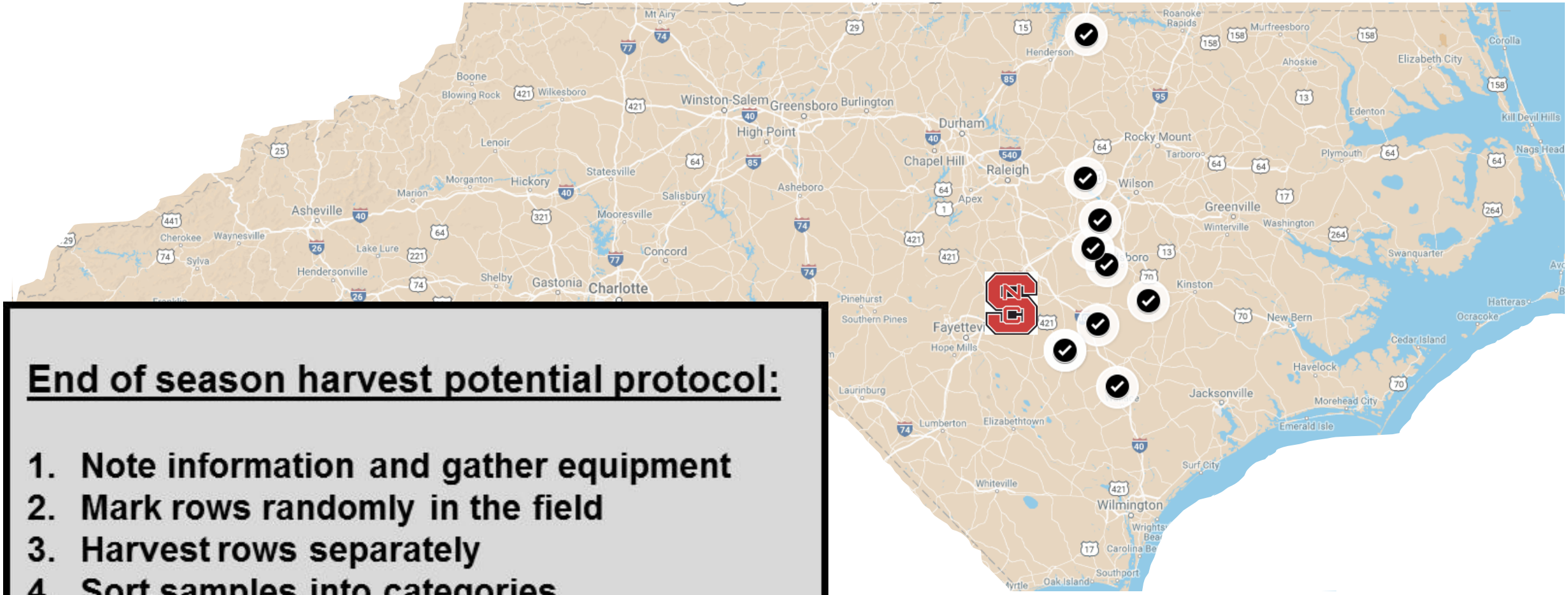
2: Create easy-to-utilize protocols and video useful to quickly determine the quantity of edible produce left in the field

3: Measure what's left in growers' fields

4: Pilot engineering-based and value-chain strategies

WHOLE CROP HARVEST

Field Measurement: Growers primarily in eastern North Carolina



End of season harvest potential protocol:

1. Note information and gather equipment
2. Mark rows randomly in the field
3. Harvest rows separately
4. Sort samples into categories
5. Weigh and record sample in each category
6. Calculate estimate of potential in field

July 4

July 11

July 14

July 24

July 31

Aug 4

Aug 8

Data collection for one crop

7 dates
10 fields
3 farms

lb/ac

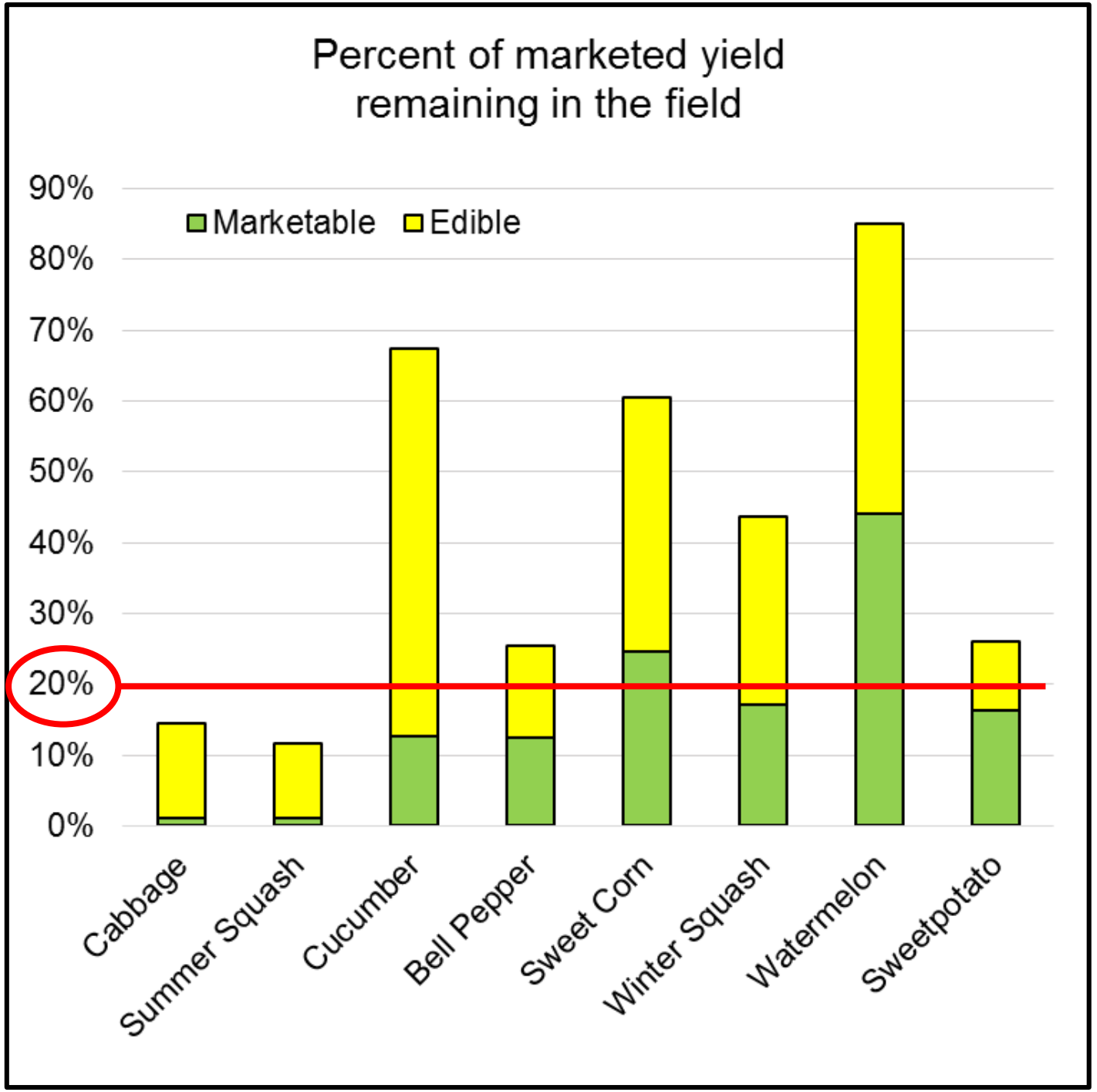
	Marketable	Edible	Inedible
Cabbage	274	3040	3296
Summer Squash	79	777	5438
Cucumber	1684	7249	7135
Bell Pepper	2866	3028	2198
Sweet Corn	1864	2734	3319
Winter Squash	1273	1961	11350
Watermelon	11086	10325	18285
Sweetpotato	3192	1921	326

Compared with three year average marketed yields in NC

(USDA-NASS and NCDA & CS, 2016; 2017)

This snapshot study suggests the estimates should be reevaluated.

42% grand mean lost in the field.



Why measure something with low economic value?

Provides a baseline for reducing losses and knowledge of volumes available.

Measurement is a tool to prevent losses, higher priority than recovery and reuse.

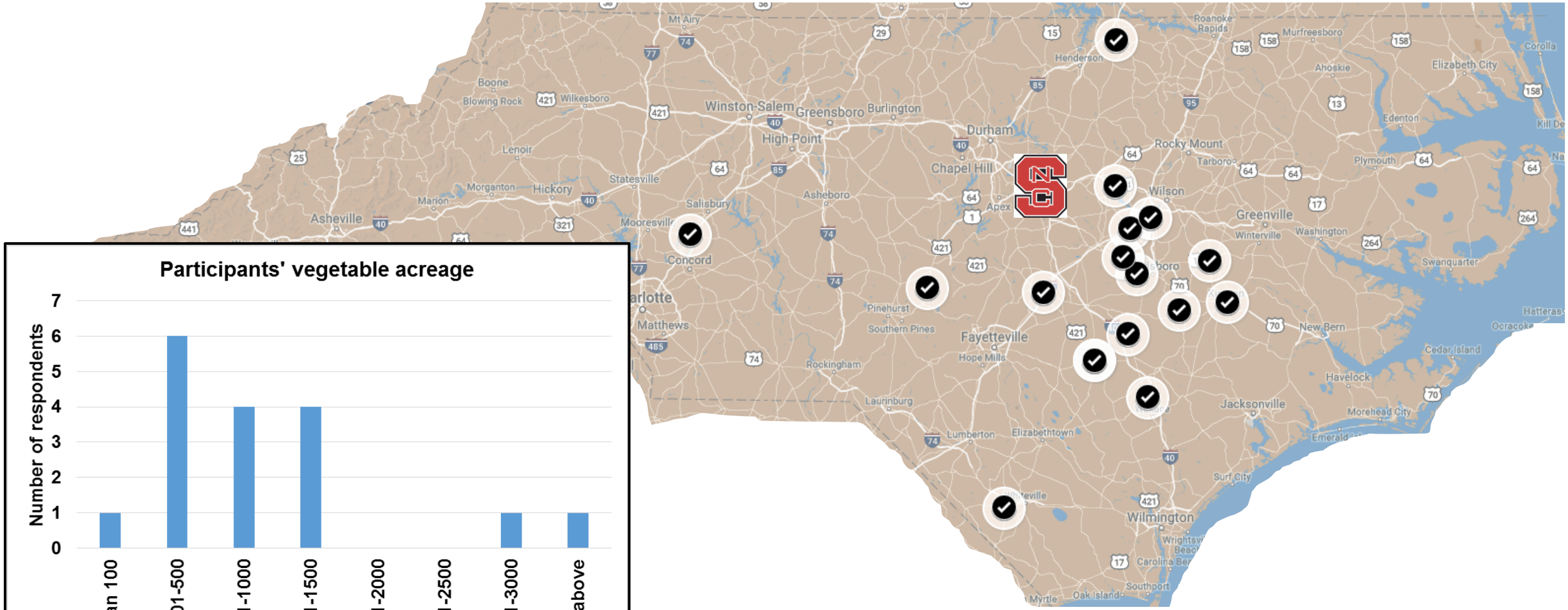
Economic incentive is already here, and more opportunities are on the horizon.

*** What gets measured, gets managed! ***

Growers' decision-making:

Growers primarily in eastern North Carolina

Operate 19.6% of vegetable production acreage



How are field losses perceived?

Low volume or low value

No measurement in field

Majority of growers did not feel comfortable providing an estimate of losses

"if you need a percentage, probably 10%, something like that. 15% maybe. And there again, it's just a lot of what's going on in the marketplace. It's hard to figure."

"We know you leave a lot of potatoes in the field. At what percent? If I told you a number, it would just be something I'm pulling out of the air."

How do growers make the decision to stop harvesting as the season winds down?

Do I have a ready buyer?

Increasing yield and utility starts here

No

Yes

Is the price high enough to support harvest costs?

No

Yes

How is the crop's quality?

Good

Are other fields of higher priority?

Yes

No

Poor

What's my risk of rejection?

High

Low

Are other fields of higher priority?

Yes

No

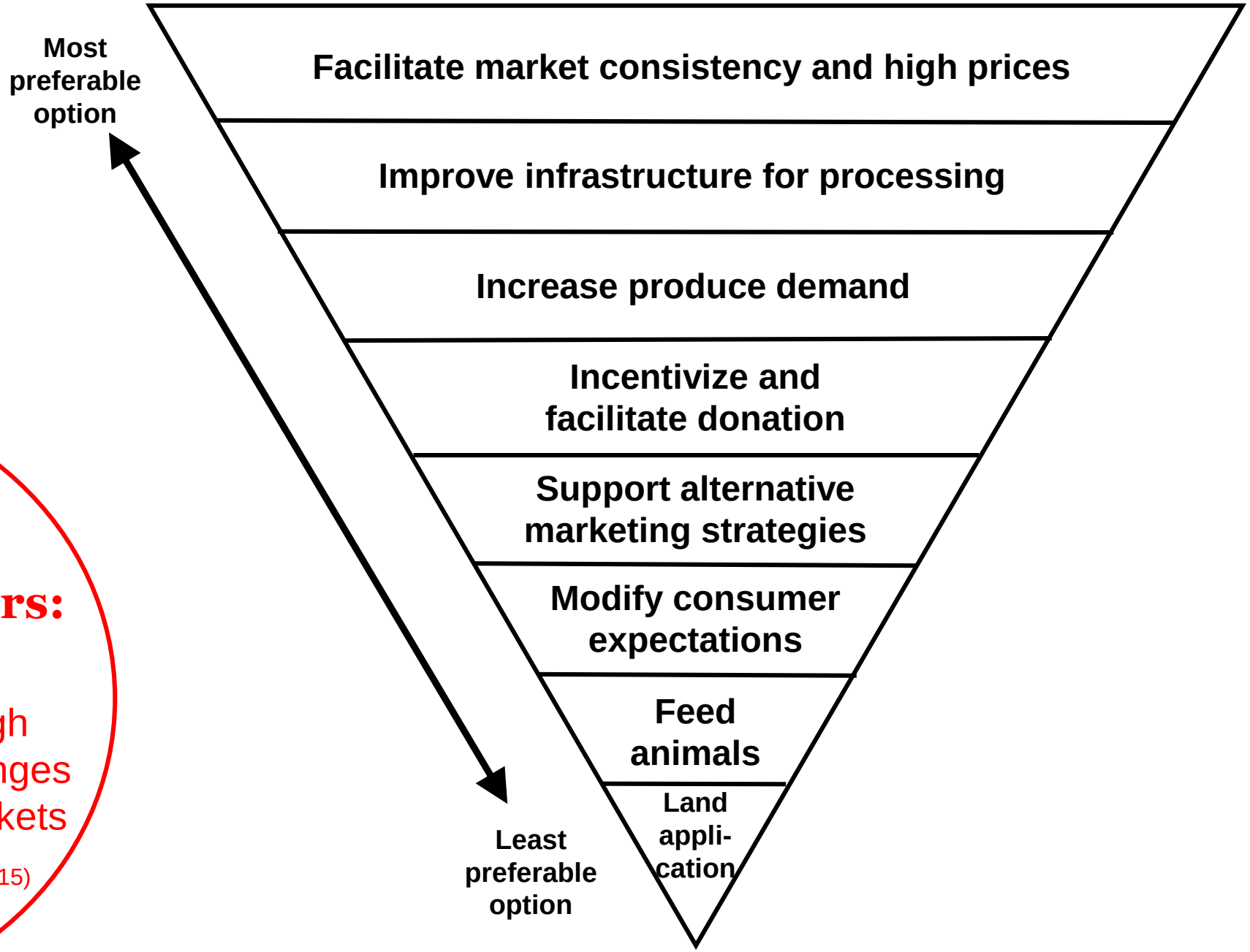
Very slim chance the field will be harvested again

Possible alternative destinations:

Buyer:	Processors	Retail and Subscription	Foodservice Distributors	Fresh Cut Operation	Food Bank
Truckloads and pallet quantities, boxed	WTRMLN WTR	Robinson Fresh Wegman's Lowes ECO Whole Foods Hungry Harvest Imperfect Produce	PRO*ACT Foster Caviness FreshPoint	Ford's Produce	Farm to Food Bank
Bulk Bins	CIFI Seal the Seasons	Hungry Harvest Imperfect Produce		Ford's Produce	Farm to Food Bank
Single Boxes	Seal the Seasons	Ungraded Hungry Harvest	Foster Caviness FreshPoint	Working Landscapes	Food Banks & local pantries

Connect → **increase marketed yield** → **potentially increase profit**

Growers' solutions to reduce losses:



Solutions often promoted for growers:

- Reducing overproduction
- Facilitating donation through infrastructure & policy changes
- Supporting alternative markets

(ReFED, 2016; Gunders, 2012; EPA, 2015)

How to Determine the Potential to Increase Vegetable Yield through Estimating and Reducing Field Losses

NC STATE EXTENSION

Vegetable grow
increase quality
they can optimi
and disease ma
improved variet
is to reduce fiel
significant porti

In North Carolina
are left unharves
to increase yield
Another way to i
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When Losses
Managed

The focus of this
technique for me

Resources, Conservation & Recycling 137 (2018) 243–250

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Full length arti

Estimating
case study

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[c] Department of Biologi

ARTICLE IN

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Food waste
Primary production
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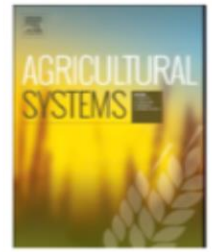

Field measurement in vegetable crops indicates need for reevaluation of on-farm food loss estimates in North America

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ABSTRACT

Food loss and waste in the US has been estimated at 40%, a figure that does not include losses at the agricultural level. Consumer food waste is expensive and environmentally damaging as it travels the length of the supply chain and largely ends up in the landfill. Most research and campaigns emphasize the consumer level, which has resulted in the omission of data collection and development of solutions for producers of fruit and vegetable

What is THE VALUE OF what is left in the field?

Meets current buyer specifications for quality, but unharvested due to market constraints.

Off-size, blemished, misshapen, or miscolored but not under or over mature. Nutritious and safe.

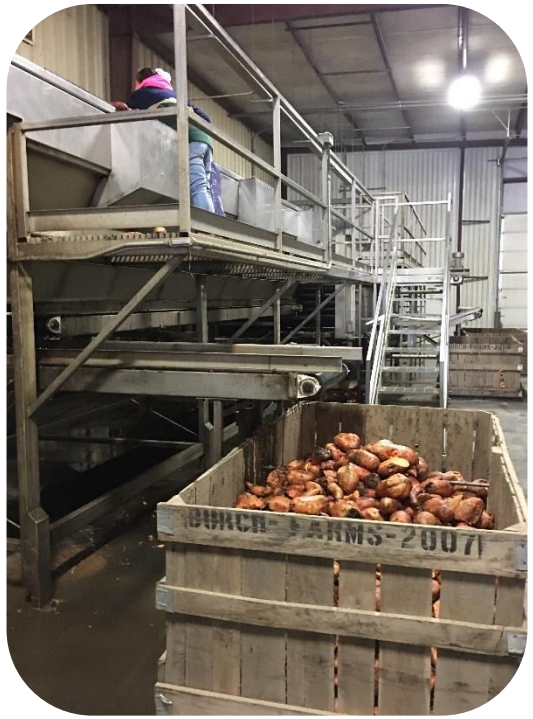
Damaged, diseased, decayed or over mature. Not suitable for human consumption

We can calculate the value based on a set of assumptions, that you can change.

- Pounds marketable and edible
- Harvest and field pack
- Harvest and shed pack
- Packaging
- Transport
- Price

Harvest/Sale Scenarios

(1)



Shed pack in bins
for 50% of WS

Harvest/Sale Scenarios

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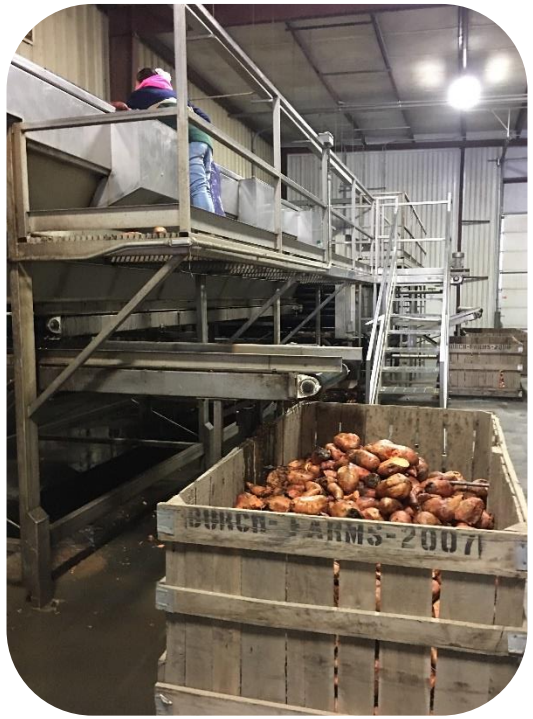


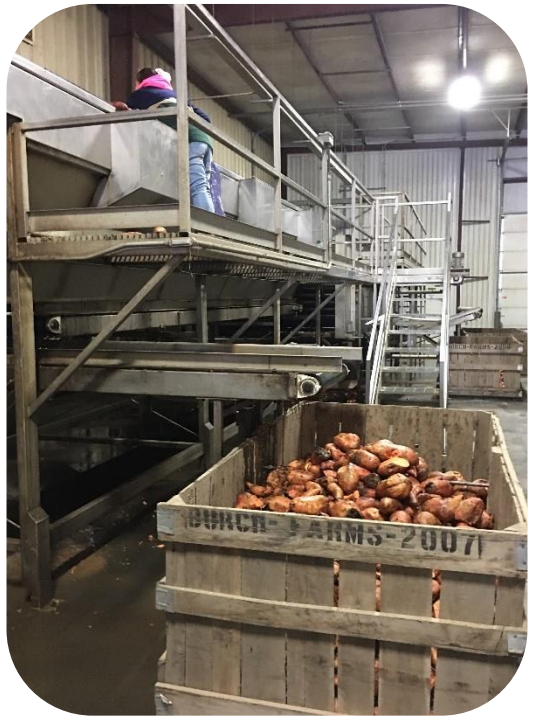
Shed pack in bins
for 50% of WS

(2)

Field pack in bins
for $0.07/lb

Harvest/Sale Scenarios

(1)



Shed pack in bins for 50% of WS

(2)

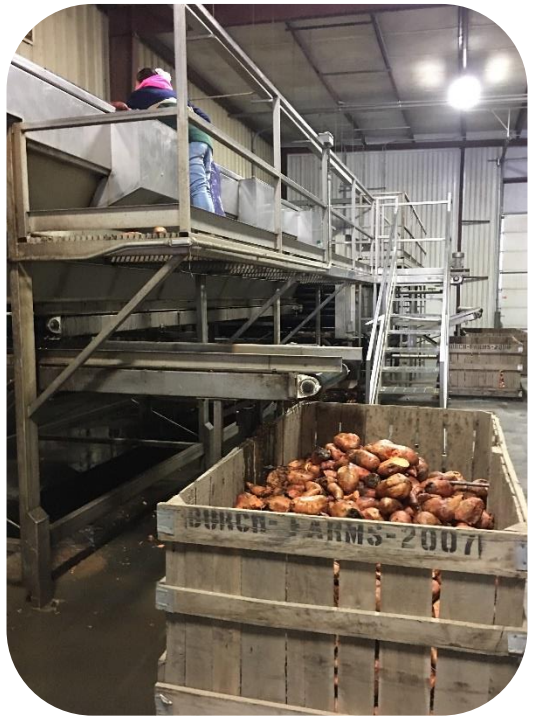
Field pack in bins for $0.07/lb

(3)

Shed pack, WS in cartons, 50% WS in bins

Harvest/Sale Scenarios

(1)



Shed pack in bins for 50% of WS

(2)

Field pack in bins for $0.07/lb

(3)

Shed pack, WS in cartons, 50% WS in bins

(4)

Shed pack, WS in cartons, $0.07 in bins

Food banks are increasingly covering some of the pick and pack costs

Packed in **cartons** for wholesale market

Packed in **bins** for 50% of wholesale market

Shed pack for wholesale, and 50% of wholesale markets

Field pack in bins for food bank market

Bell Peppers

Costs & Returns per Acre

Marketable = 2,866 Edible = 3,028 Inedible = 2,198 Total to harvest/sell = 5,894	Harvest	Pack	Packaging	Total Costs	Sales	NET
(1) Shed pack in bins for 50% of WS (50% of $0.46/lb)						
(2) Field pack in bins for $0.07/lb						
(3) Shed pack, WS in cartons, 50% WS in bins						
(4) Shed pack, WS in cartons, $0.07 in bins						

Bell Peppers

Costs & Returns per Acre

Marketable = 2,866 Edible = 3,028 Inedible = 2,198 Total = 2,198	Harvest	Pack	Packaging	Total Costs	Sales	NET
(1) Shed pack in bins for 50% of WS (50% of $0.46/lb)	$318	$368	$191	$897	$1,344	$447
(2) Field pack in bins for $0.07/lb	$318	$0	$191	$509	$413	($96)
(3) Shed pack, WS in cartons, 50% WS in bins	$318	$368	$251	$938	$1,997	$1,059
(4) Shed pack, WS in cartons, $0.07 in bins	$318	$368	$251	$938	$1,519	$580

Net Returns ($) per Acre for Additional Harvest, Select Southeastern Vegetable Crops

	Bell Pepper	Cabbage	Cucumber	Yellow Squash	Sweet Corn	Sweet Potato
Scenario 1: Packed in bins at 50% of wholesale price	466	(557)	823	(137)	(178)	88
Scenario 2: Field packed, sold in bins at $0.07/lb	(97)	(338)	38	(277)	(155)	106
Scenario 3: Packed in cartons for marketable and bins for edible; wholesale price for marketable and 50% of this for edible	1,059	(538)	1,135	(116)	5	515
Scenario 4: Packed in cartons for marketable and bins for edible; wholesale price for marketable and $0.07/lb for edible	580	(580)	211	(289)	(111)	364

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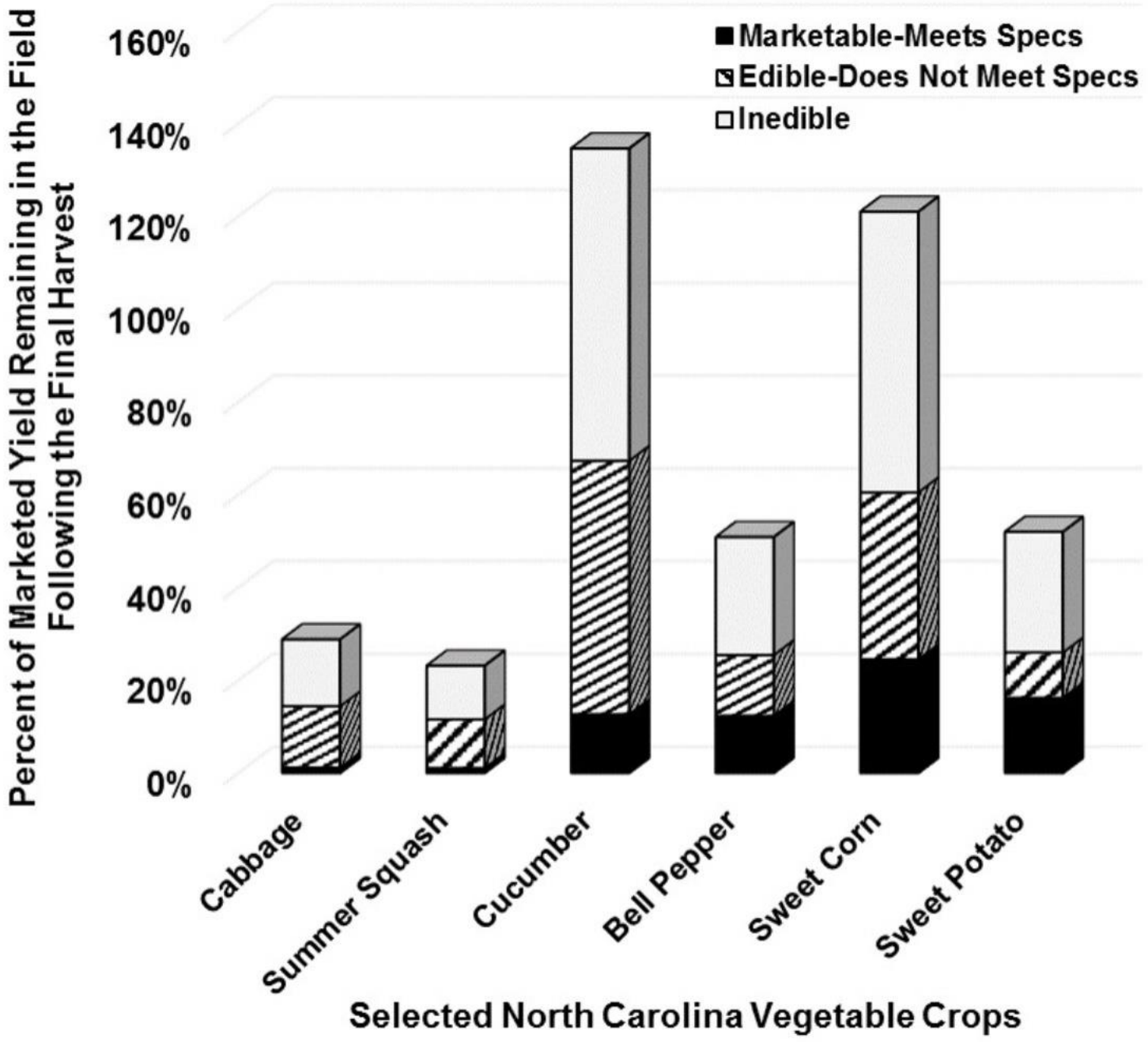
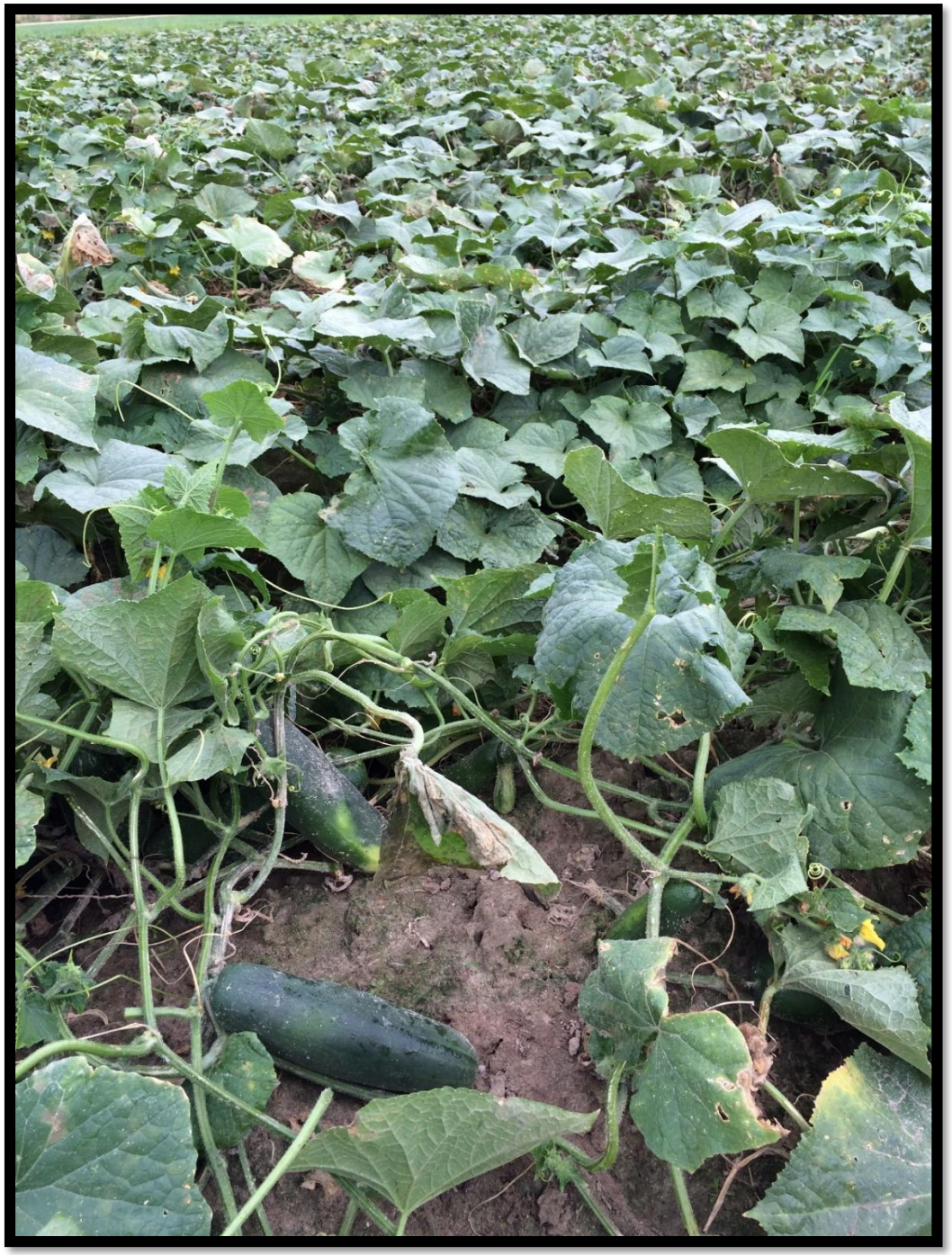
Most profitable for all:
Scenario 3:
Cartons for wholesale and bins for 50% of wholesale

Next most profitable:
> For crops w/high volume *marketable*: sweet potato and bell pepper
Scenario 4:
Cartons for wholesale and bins for $0.07/lb
> For crops w/high volume *edible*: cucumber
Scenario 1:
Packed in bins for 50% of wholesale





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WHOLE CROP HARVEST