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# INVESTIGATING ETHNIC AND SPECIALTY CROPS PRODUCTION ON THE DELMARVA PENINSULA

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# OUTLINE

- Project Background
- Project Goals
- Project Objectives
- Project Overview



# PROJECT BACKGROUND

## 10<sup>th</sup> Annual Small Farms Conference (2013)

- “World-Food Ethnic Crops” Educational Session
- Small Farmers: Strong Interest in Growing Ethnic Crops

## Capacity Building Grant

- Stakeholder-Driven & Farmer Centered
- Demand for locally grown & safe food as well as non-traditional food continues to rise
- Economic opportunities have arisen for specialty crop production catering to the ethnically diverse consumers along the eastern coast of the United States



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# PROJECT BACKGROUND: DELMARVA PENINSULA

- Increasing immigrant/ethnic population on Delmarva has created the demand for ethnic crops in the region
- Increased demand for locally grown food provides opportunities for small farmers to grow ethnic and specialty crops to serve the increasing local ethnic markets
- Niche markets can create opportunities for small farmers to sustain farming operations and increase profitability

Ethnic Groups	Population (2010)
Native American	149,500
Asian	895,900
African American	3,643,400
Hispanic	1,175,600
Caucasian	9,808,200
<b>Total Population</b>	<b>15,672,600</b>

Census of Population, 2010 ([www.census.gov/population](http://www.census.gov/population))

# PROJECT GOALS

## **Overall Goal of Project:**

- Address stakeholders' needs, provide research-based production and marketing practices, and evaluate the economic viability of popular ethnic crops that can successfully be grown on the Delmarva Peninsula
- Assist small farmers in the production of high-value alternative crops that could improve the profitability of small farm operations

# PROJECT OBJECTIVES

- **Objective 1:** Investigate the potential of ethnic and specialty crop production on the Delmarva Peninsula through ethnic/specialty crop trials
- **Objective 2:** Develop enterprise budgets and marketing guidelines for the ethnic crops that thrive under the local climatic conditions
- **Objective 3:** Provide ethnic and specialty crop production guidelines to the stakeholders
- **Objective 4:** Provide outreach and educational opportunities for ethnic and specialty crop production practices

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# PROJECT OVERVIEW

## Objective 1: Field Screening Crop Trials (2015)

- University of Maryland Eastern Shore (UMES) Agricultural Experiment Station in Princess Anne, MD
- Field trials were conducted to select elite plant species that perform well in the local environment
- Twenty-one Chinese, Asian, Indian, Hispanic, Caribbean, and African ethnic crops were evaluated in the crop trials
  - Experimental Design: Randomized Complete Block Design with four replications each
  - Each Plot: one 3-meter row per crop with one meter between rows and two meters between plots
  - Crop quality, yield, and ease of growth were evaluated





# TABLE 1: ETHNIC CROPS USED IN THE 2015 CROP TRIALS

Ethnic Groups	Common Names	Ethnic Crops Botanical Names
<b>Chinese</b>	Smooth Luffa	<i>L. aegyptiaca</i>
	Oriental Eggplant	<i>Solanum melongena</i>
	Edamame	<i>Glycine max</i>
	Napa Cabbage	<i>Brassica rapa sub sp. pekinensis</i>
	Bok Choy	<i>Brassica rapa sub sp. Chinensis</i>
<b>African</b>	Avuvo	<i>Celosia argentea</i>
	Garden Egg	<i>Solanum acutangula</i>
	Gboma	<i>Solanum macrocarpon</i>
	Kitely	<i>Solanum gilo</i>
	Jute Leaf	<i>Corchorus olitorius</i>
	Water Leaf	<i>Talinum triangulare</i>
	Jamma Jamma	<i>Solanum scabrum</i>

Ethnic Groups	Common Names	Ethnic Crops Botanical Names
<b>Asian</b>	Bottle Gourd	<i>Lagenaria siceraria</i>
	Fenugreek	<i>Trigonella foenum-graecum</i>
<b>African/ Jamaican</b>	Amaranth (3 different varieties)	<i>Amaranthus</i> ( <i>viridis</i> , <i>callaloo</i> , and <i>prya</i> )
	Hibiscus	<i>Hibiscus sabdariffa</i>
	Pumpkin	<i>Cucurbita maxima</i>
<b>Asian/ Indian</b>	Hyacinth Beans	<i>Lablab purpureus</i>
	Snow Peas	<i>Pisum sativum</i>
<b>Mexican</b>	Tomatillo	<i>Physallis philadelphica</i>

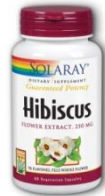
# 2015 CROP TRIALS



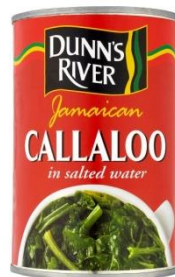
# 2015 CROP TRIALS



# ELITE PLANT SPECIES



Sorrel (*Hibiscus Sabdariffa*)



Callaloo (*A. viridis*)



Bok choy (*Brassica rapa*)

# PROJECT OVERVIEW: DELMARVA PENINSULA

## Cropping on the Delmarva Peninsula

- Constrained by sandy soils that are mainly acidic and low in plant nutrients
- Region is prone to high temperatures and periodic drought conditions during the growing season
  - Results in low yield production and low farm income

## Sustainable Production Practices

- Improve soil biodiversity
- Improve soil fertility
- Provide safe and nutritious crops
- Reduce the use of chemical fertilizers
- Reduce environmental pollution



(www.worldatlas.com)

# PROJECT OVERVIEW: OBJECTIVE I

## Sustainable Production Practices (2016)

- University of Maryland Eastern Shore (UMES)  
Agricultural Experiment Station in Princess Anne, MD
- Evaluate various sustainable production practices to analyze the growth and development of the selected elite plant species (bok choy, amaranth, hibiscus)
- Organic Fertilizers
  - Compost & Vermicompost
  - Fish Emulsion
  - Biofertilizers

## Benefits of Organic Fertilizers

- **Compost and Vermicompost:** Increase crop yield, suppress diseases, reduce waste, improve soil fertility and structure, increase microbial population, improve plant health, and nutritional quality
- **Fish Emulsion:** Improve plant growth and yield, suppress diseases, and increase microbial population
- **Biofertilizers:** Nitrogen fixation, solubilize phosphorus, and stimulate plant growth (Vesicular-Arbuscular Mycorrhiza, *Trichoderma*, *Azospirillum*)

# PRELIMINARY GREENHOUSE EXPERIMENTS

**Greenhouse Study 1:** Evaluate and identify elite biofertilizer(s) on bok choy growth and development using a complete randomized design with 8 treatments, 2 soil types (potting mix and field soil) with 4 replicates each

## **Biofertilizer Treatments:**

1. Control (no inoculum)
2. Trichoderma
3. **Azospirillum**
4. Endo/Ectomycorrhizae
5. Trichoderma + Azospirillum
6. Trichoderma + Endo/Ectomycorrhizae
7. Azospirillum + Endo/Ectomycorrhizae
8. Trichoderma + Azospirillum + Endo/Ectomycorrhizae

**Greenhouse Study 2:** Evaluate the effect of organic fertilizers on the growth and development of bok choy using a complete randomized design with 9 treatments and 4 replicates each

## **Organic Fertilizer Treatments:**

1. Chemical Fertilizer (Control)
2. Vermicompost Tea 1 (*Veteran Compost*)
3. Vermicompost Tea 2 (*Wiggle Worm Soil Builder*)
4. Fish Emulsion 1 (*Alaska Fish Emulsion*)
5. Fish Emulsion 2 (*Neptune's Harvest Fish Emulsion*)
6. **Vermicompost Tea 1 + Fish Emulsion 1**
7. Vermicompost Tea 1 + Fish Emulsion 2
8. Vermicompost Tea 2 + Fish Emulsion 1
9. Vermicompost Tea 2 + Fish Emulsion 2

# 2016 FIELD RESEARCH EXPERIMENT ONE

**Objective:** Investigate the effect of organic fertilizers on the growth and development of bok choy

## Fertilizer Treatments:

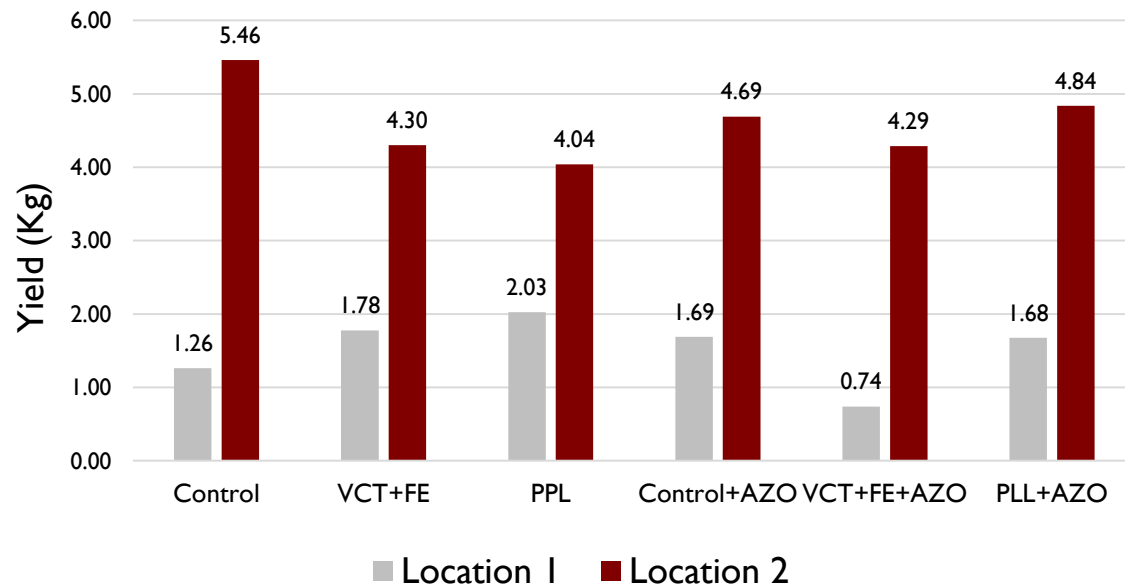
1. Commercial Fertilizer (20-20-20) (**Control**)
  2. Vermicompost Tea + Fish Emulsion (**VCT+FE**)
  3. Poultry Litter Leachate (**PLL**)
  4. Commercial Fertilizer + Azospirillum (**AZO**)
  5. Vermicompost Tea + Fish Emulsion + Azospirillum
  6. Poultry Litter Leachate + Azospirillum
- Experimental Design: Randomized Complete Block Design with four replications each (two locations/two growing seasons)
  - Each Plot: three 1.5-meter rows with 1 meter between rows and 2 meters between plots; 8" spacing between plants
  - Yield and crop quality were evaluated



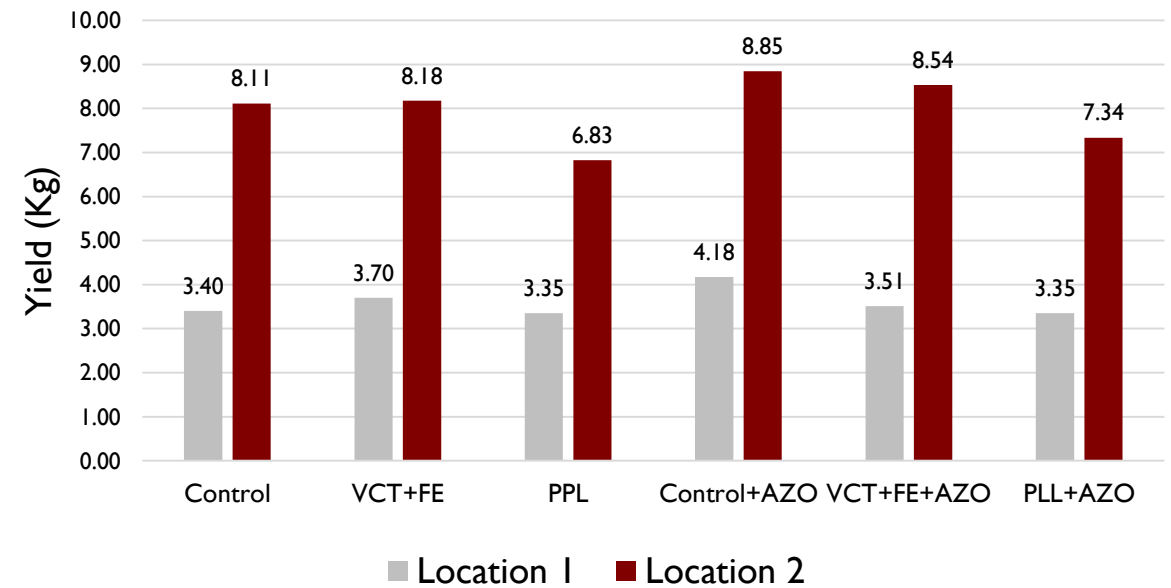


# EXPERIMENT ONE RESULTS: BOK CHOY

## Early Summer Bok Choy



## Late Summer Bok Choy



# 2016 FIELD RESEARCH EXPERIMENT TWO

**Objective 1:** Investigate the effect of organic fertilizers on the growth and development of sorrel and callaloo

## **Fertilizer Treatments:**

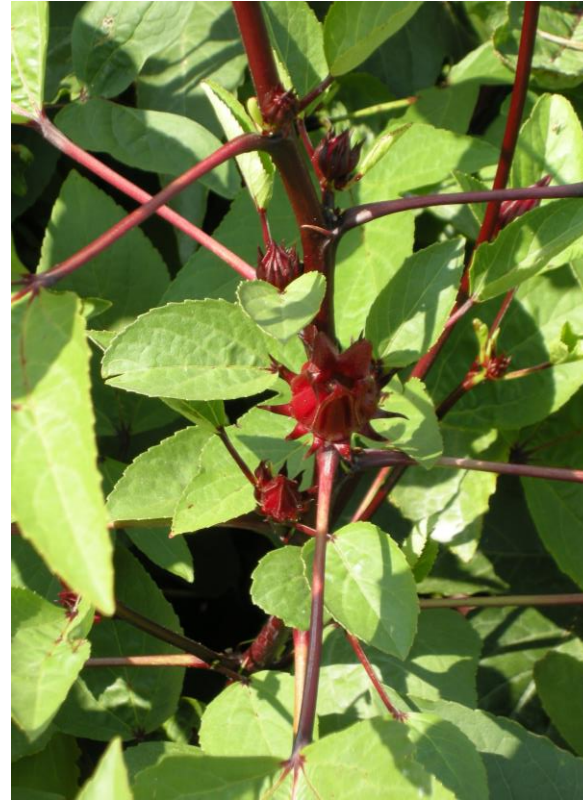
1. Commercial Fertilizer (20-20-20) (**Control**)
  2. Vermicompost Tea + Fish Emulsion (**VCT+FE**)
  3. Poultry Litter Leachate (**PLL**)
- Experimental Design: Randomized Complete Block Design with four replications each (two locations)
  - **Callaloo Plots:** three 2-meter rows with 1 meter between rows and 2 meters between plots; 12" spacing between plants
  - **Sorrel Plots:** three 3-meter rows with 1 meter between rows and 2 meters between plots; 18" spacing between plants
  - Yield and crop quality were evaluated

**Objective 2:** Investigate the effect of biofertilizers on the growth and development of sorrel and callaloo

## **Biofertilizer Treatments:**

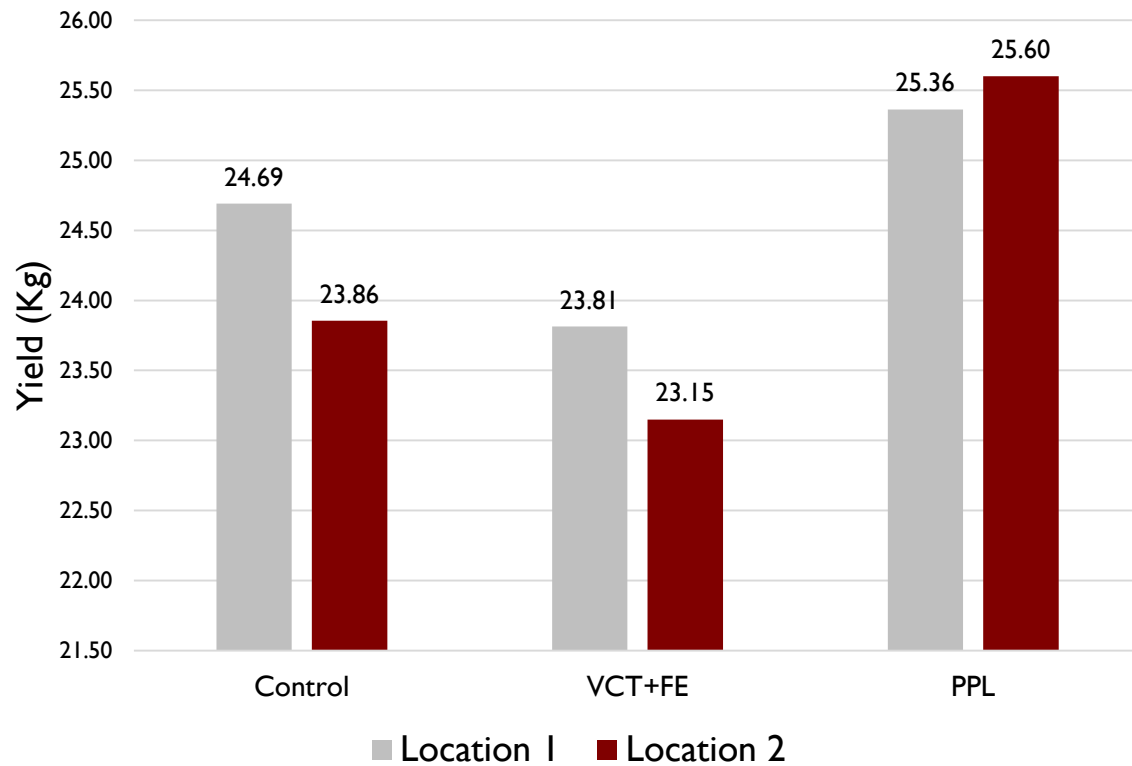
1. Commercial Fertilizer (20-20-20) (**Control**)
2. Azospirillum (**AZO**)
3. Endo/Ectomycorrhizae (**Endo/Ecto**)

# 2016 FIELD RESEARCH EXPERIMENT TWO

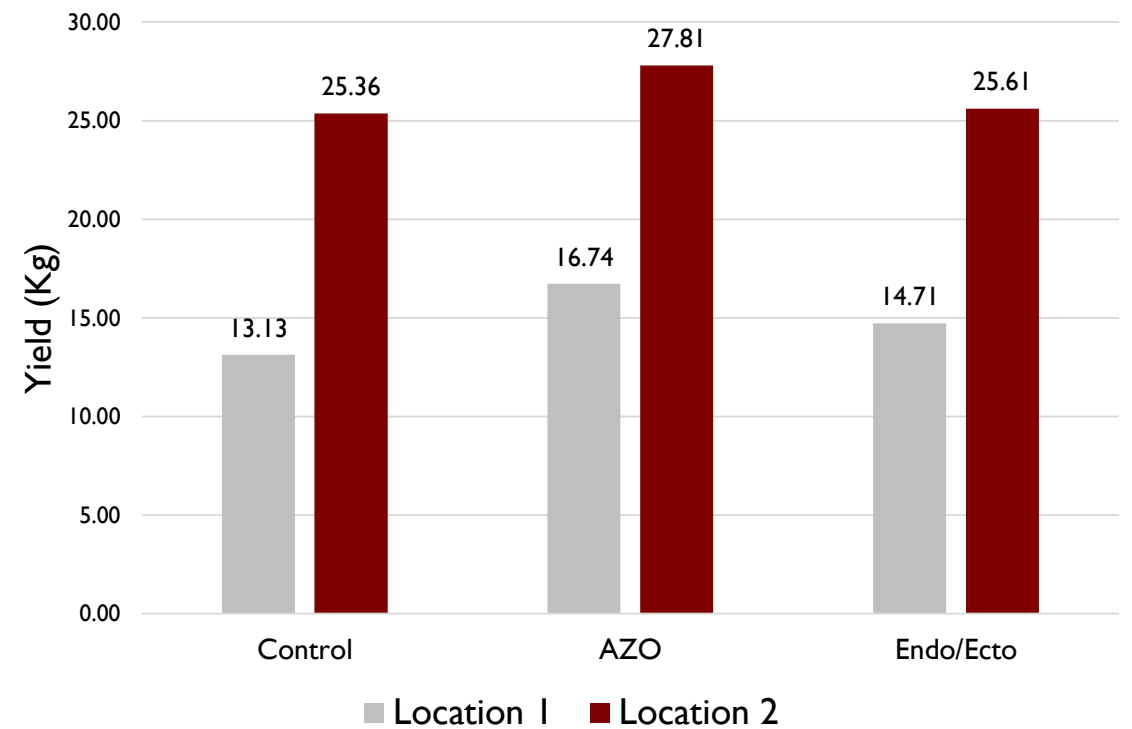


# EXPERIMENT TWO RESULTS: CALLALOO

## Objective 1: Organic Fertilizers

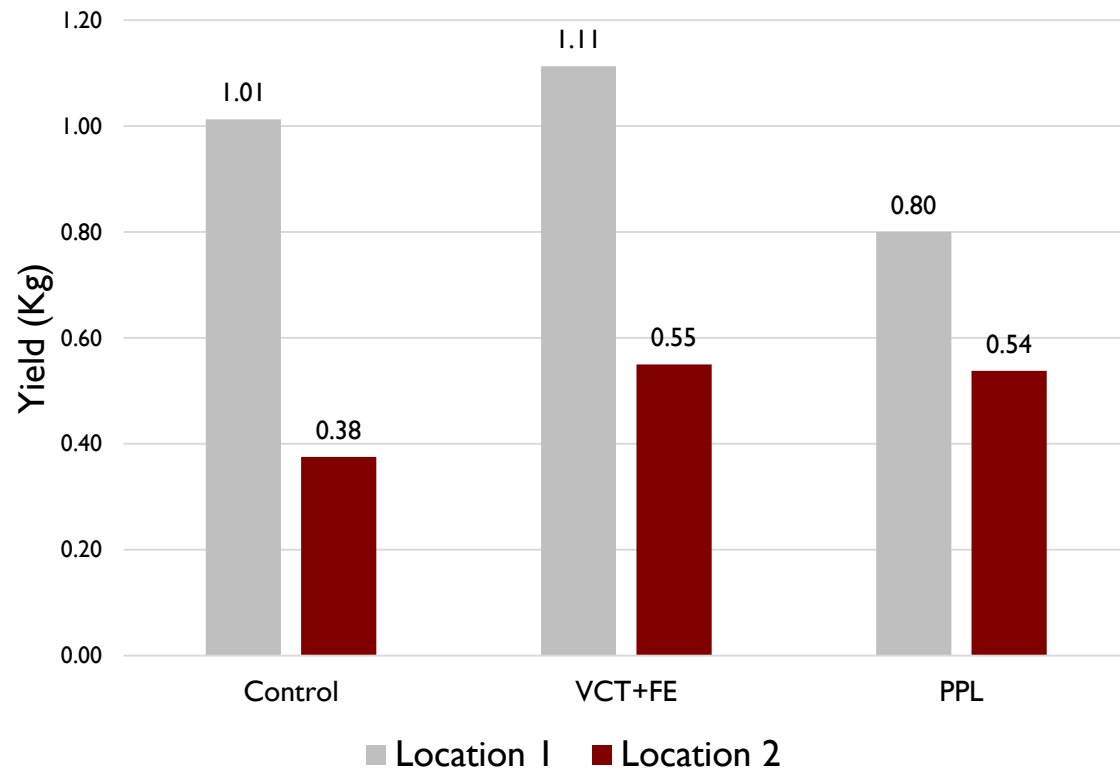


## Objective 2: Biofertilizers

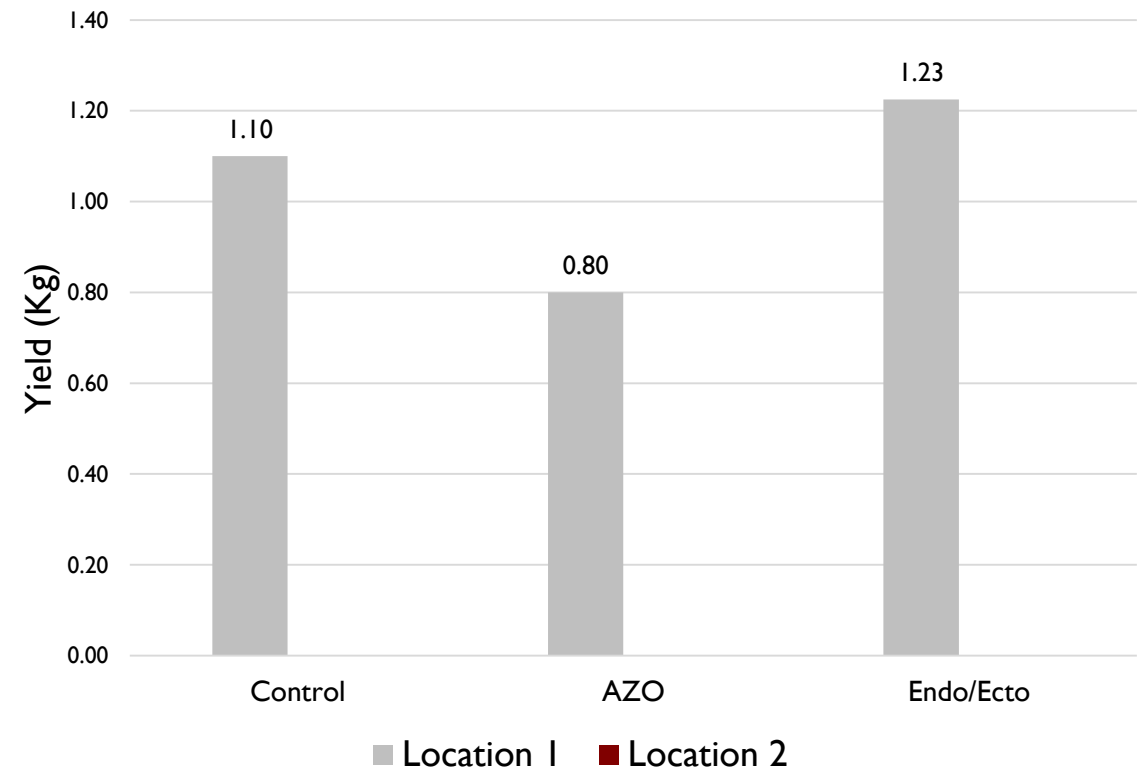


# EXPERIMENT TWO RESULTS: SORREL

## Objective 1: Organic Fertilizers



## Objective 2: Biofertilizers



## FURTHER ANALYSIS

Evaluate the effect of sustainable production practices (organic fertilizers and biofertilizers) on the phytonutrient and mineral content of bok choy, sorrel, and callaloo

- Phytonutrients (carotenoids, glucosinolates, and phenolic compounds)
- Vitamins (B- profile, K, and total vitamin A (retinol and beta-Carotene and vitamin C)
- Minerals (such as Ca, Fe, K, Se, P, and Mg)

## 2017 ON-FARM TEST TRIALS

**Objective 4:** Provide outreach and educational opportunities for ethnic and specialty crop production practices

- **On-Farm Test Trials:** Conducted by participating small farmers on the Delmarva
- **Purpose:** To demonstrate the practicality and viability of growing specialty crops in a “real farm” environment

# THANK YOU

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