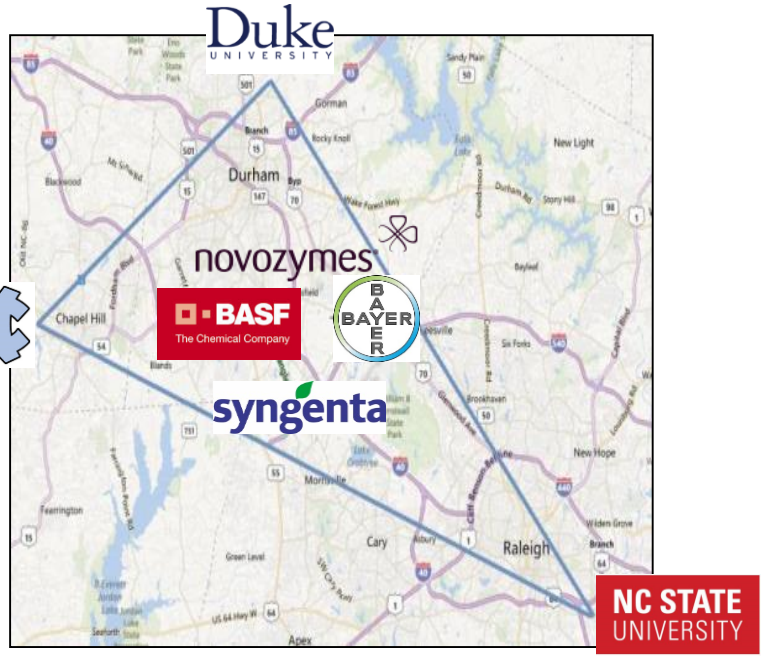
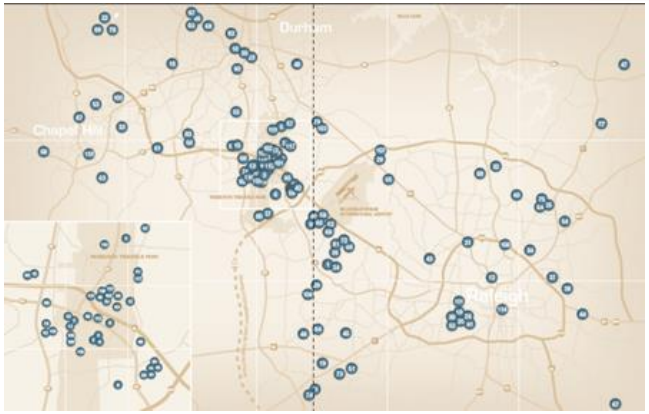
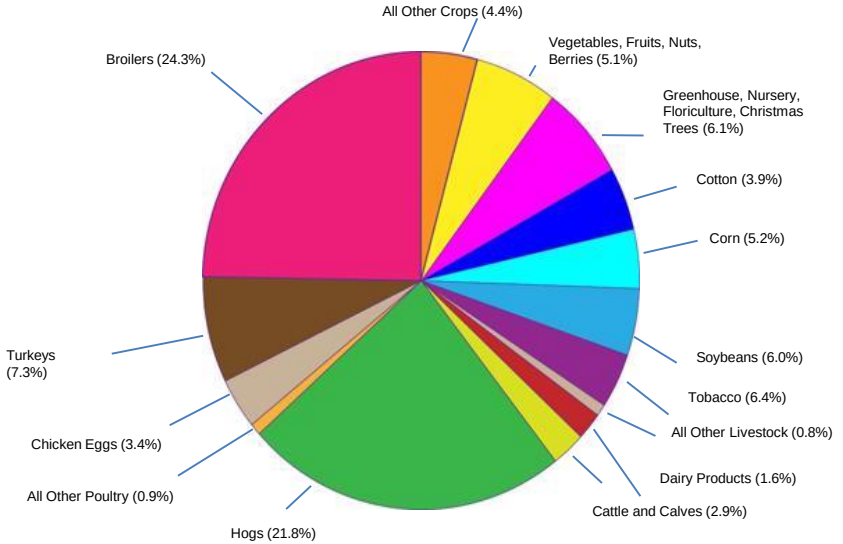
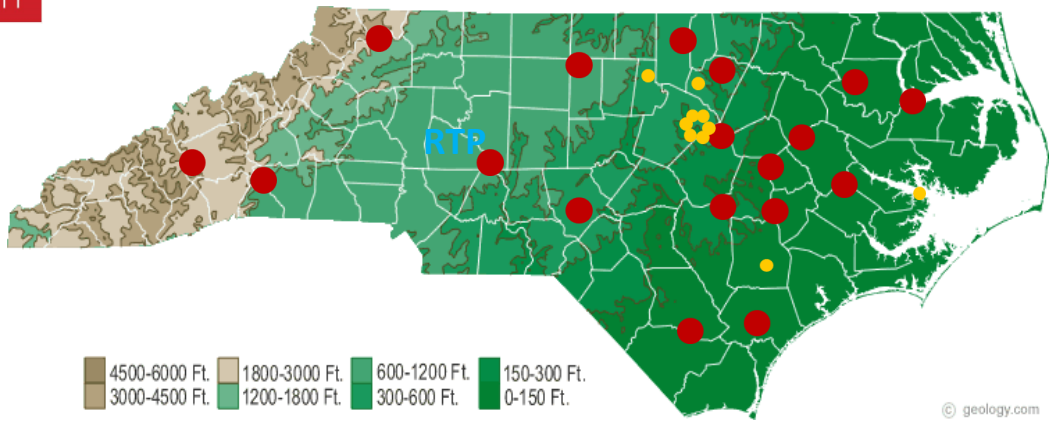
NC UNIQUE ASSETS









18 Research Stations 10 Field Laboratories

Center for Plant Breeding & Applied Plant Genomics

NC State University has a long and distinguished history of innovative plant breeding research and development of quantitative genetic and DNA marker-assisted selection theory. A strong component of the success of NC State's breeding programs has been the complementary research in plant genomics.

NCSU Plant Breeding Consortium

- Over 35 core faculty developing new cultivars, germplasms, parental lines
- More plant breeders than any other U.S. university
- Center is interdepartmental
- More than 65 faculty members provide skills in DNA-based marker technology, genomics, proteomics and metabolomics in addition to basic field breeding
- Full range of research programs, courses and crops

Graduate Student Education and Training

Nearly 40 faculty members in four departments involved directly in the education and training of graduate students in plant breeding Nearly 50 graduate students actively pursuing degrees in plant breeding

NCSU CALS Plant Breeding Faculty

CROP SCIENCE

Carter, Tommy - (USDA-ARS) Soybean (G,V)
Goodman, Major - Maize (G,V)
Holland, James - (USDA-ARS) Maize (G)
Isleib, Thomas- Peanut (G,V)
Krakowsky, Matt (USDA-ARS) Maize (G)
Kuraparthy, Vasu- Cotton (G,V)
Lewis, Ramsey - Tobacco (V)
Mian, Rouf – (USDA-ARS) Soybean (G,V)
Milla-Lewis, Susana - Turfgrass (G,V)
Murphy, Paul - Wheat, Oat, Triticale (G,V)
Stalker, Thomas – Peanut (G)

PLANT PATHOLOGY

Marshall, David - (USDA-ARS) Small grains (G,V)

FORESTRY (CNR)

Hodge, Gary – Pines, Eucalypts, Gmelina and Teak, and some threatened southern coniferous species (G)

HORTICULTURAL SCIENCE

Hamid Ashrafi – blueberry (V)
Ballington, James – blueberries (emeritus) (G,V)
Fernandez, Gina - blackberries & raspberries (V)
Gardner, Randy –tomatoes (emeritus) (G,V)
Kornegay, Julia - cut flowers (pre breeding)
Panthee, Dilip - tomato (G,V)
Ranney, Thomas - nursery &biomass crops (V, new crops)
Wehner, Todd – cucurbits (G,V)
Werner, Dennis - peaches, & ornamentals (V)
Yencho, G. Craig - potato and sweet potato (G,V)

G = germplasm
V = Varieties

Agronomic & Horticultural Crops in the Plant Breeding Research & Graduate Student Training Programs

- Blueberry
- Brambles (raspberry, blackberry)
- Christmas trees
- Corn
- Cotton
- Cucurbits
- Loblolly pine
- Nectarine, Peach
- Nursery crops, ornamentals
- Peanut
- Soybean
- Strawberry
- Small grains (wheat, oat, triticale)
- Pine (subtropical, tropical)
- Sweetpotato
- Tobacco
- Tomato
- Turfgrass, switchgrass

Past & Current Graduate Student Support in Plant Breeding & Applied Genomics

		Programs	
Funding Source	Fellows	Degrees	Total
Monsanto	10	14	27*
Dupont/Pioneer	7	7	7
Cotton Inc	1	2	2
Amer. Soybean Assn.	1	1	1

*Includes matching fellows (5 NCARS, 2 Crop Science Dept, 6 USDA-ARS)

Plant Breeding Center Graduates

• Monsanto	18
• Monsanto/Seminis	5
• DuPont/Pioneer	19
• Syngenta	7
• Bayer Crop Science	5
• Dow AgroSciences	3
• BASF	1
• Weaver Pop Corn	2
• Eli Lilly	1
• Harris Moran	1

Research Focus Areas & Accomplishments

- Cultivar & Germplasm Development
  - ~500 Releases – Crop Science Department
  - ~200 Releases – Horticultural Science Department
- Genetic Basis and Improvement of Agronomic and Horticultural Traits Using Quantitative Genetic and DNA-based Technology
  - Yield of Food, Feed, Fiber, and Biomass
  - Resistance to Biotic and Abiotic Stresses
  - Improved Nutritional Quality and Allergen Reduction
  - Improved End-Use Quality, Taste, Appearance, Shelf-life
  - Breeding for Organic Production Systems
- Evaluation, Conservation and Broadening of Genetic Diversity
- Transformation Technology and Development of Transgenic Plants
- Natural Products, Carcinogen Reduction
- Functional Genomics of Cellular and Metabolic Processes
- Biofuels, Bioproducts and Bioprocessing

Example of NCSU Varieties

- NC Coverage
  - Over 50% of blueberry
  - Over 90% of sweetpotato
  - Over 50% of tomato are released by NCSU but many companies use our germplasm in developing their variety releases
  - Over 85% of peanut
- Buddleja series (dwarf butterfly bush)
  - Miss Ruby, Blue Chip
- Peach
  - Contender, China Pearl

Breeding for Niche Grain Markets

- 'Carolina White' wheat is a locally adapted soft white wheat variety (note: eastern region soft white wheat is adapted to MI & NY but not NC)

- NC09-4503N high yielding, early maturing, medium statured, hulless oat with good test weight, plump groats with moderate pubescence and moderate winter hardiness. Will be released for use by Malt houses to produce NC malt and NC brewed beer

Breeding for Organic Small Grain Markets

- Identified combinations of vernalization and photoperiod genes that impart necessary early spring growth habit to wheat plants that are most competitive to the weed ryegrass
- Planning to obtain more data on the various combinations of alleles at the vernalization and photoperiod loci that are most beneficial.
- Two advanced generation Organic Winter wheat lines that display early growth/tall plant stature exhibiting weed competitive ability and contain major genes for Scab and Hessian fly resistances.

2015 Royalties & Distributions

	FY15	NCFSP 5%	Other - Groups	NCARS	Breeders	OTT
Tobacco	342,675.44	17,133.77	84,366.72	114,955.70	73,467.88	52,751.37
Sweet Potato	331,509.65	16,575.48	51,849.37	127,687.09	81,238.63	54,159.08
Sweet Potato Ornamentals	216,722.00	10,836.10		102,942.95	61,765.77	41,177.18
Ornamentals	146,501.58	7,325.08		70,792.34	40,548.86	27,835.30
Peanuts	851,825.44	42,591.27	262,679.97	231,917.10	227,874.11	86,762.99
Tomatoes	238,367.66	11,918.38		138,607.55	42,551.87	45,289.86
Grains	35,151.88	1,757.59	14156.74	10,412.64	4,977.40	3,847.51
Other	28,972.86	1,448.64	2,731.38	12,657.30	6,934.82	5,200.72
Totals	2,191,726.51	109,586.33	415,784.18	809,972.67	539,359.34	317,024.01

Grafting