



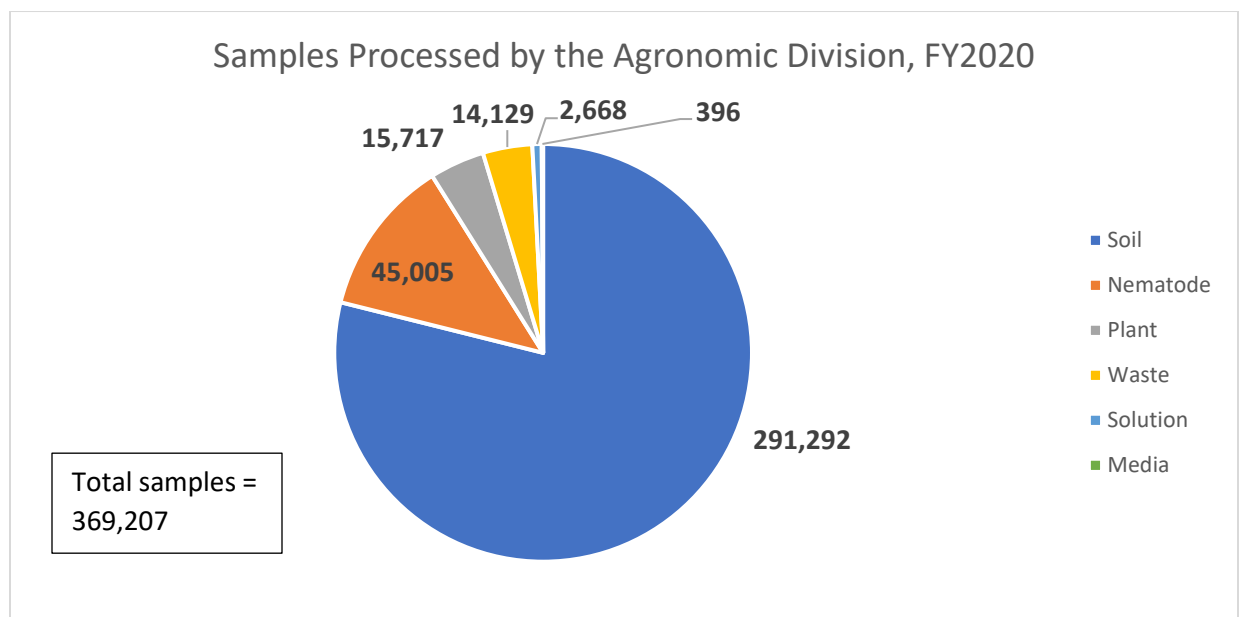
Agronomic Division —2020 Annual Report

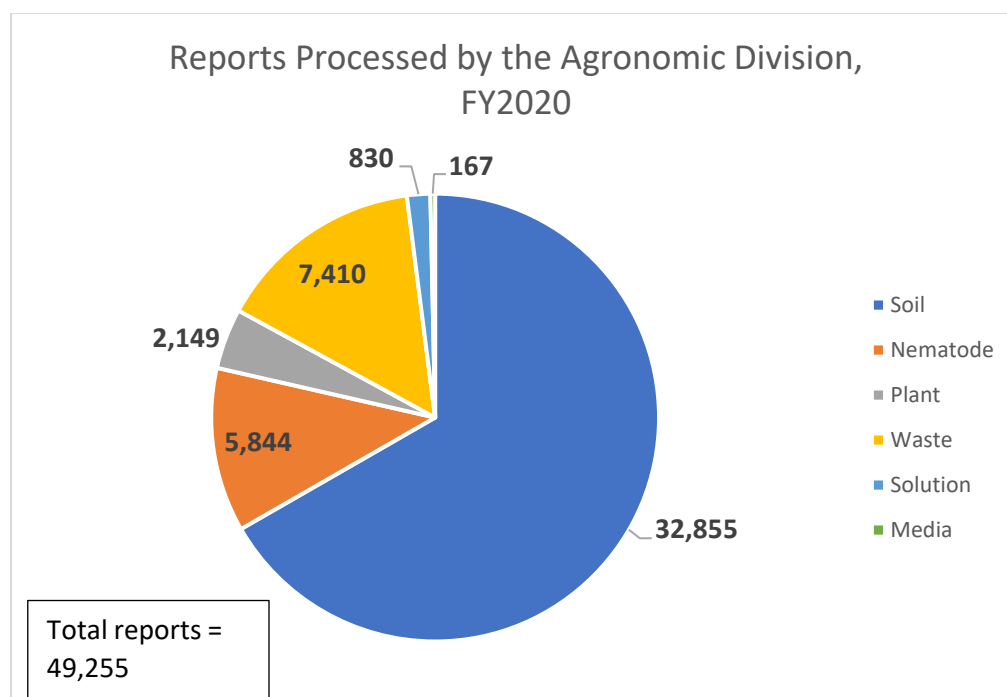
Colleen Hudak-Wise, Ph.D., director, (919) 733-2655

Introduction

The Agronomic Services Division’s mandate is to provide all North Carolina residents with diagnostic and advisory services that increase agricultural productivity, promote responsible land management and safeguard environmental quality. The Agronomic Services Division is the largest publicly operated agronomic laboratory in the country, offering the following laboratory services: soil testing, plant tissue analysis, waste analysis, solution analysis, soilless media analysis and nematode assay.

The Agronomic Division’s laboratories processed 369,207 total samples during FY2020, which is approximately a 2% decrease over the previous year. Over 49,000 reports with test results and recommendations were prepared for clients during FY2020.





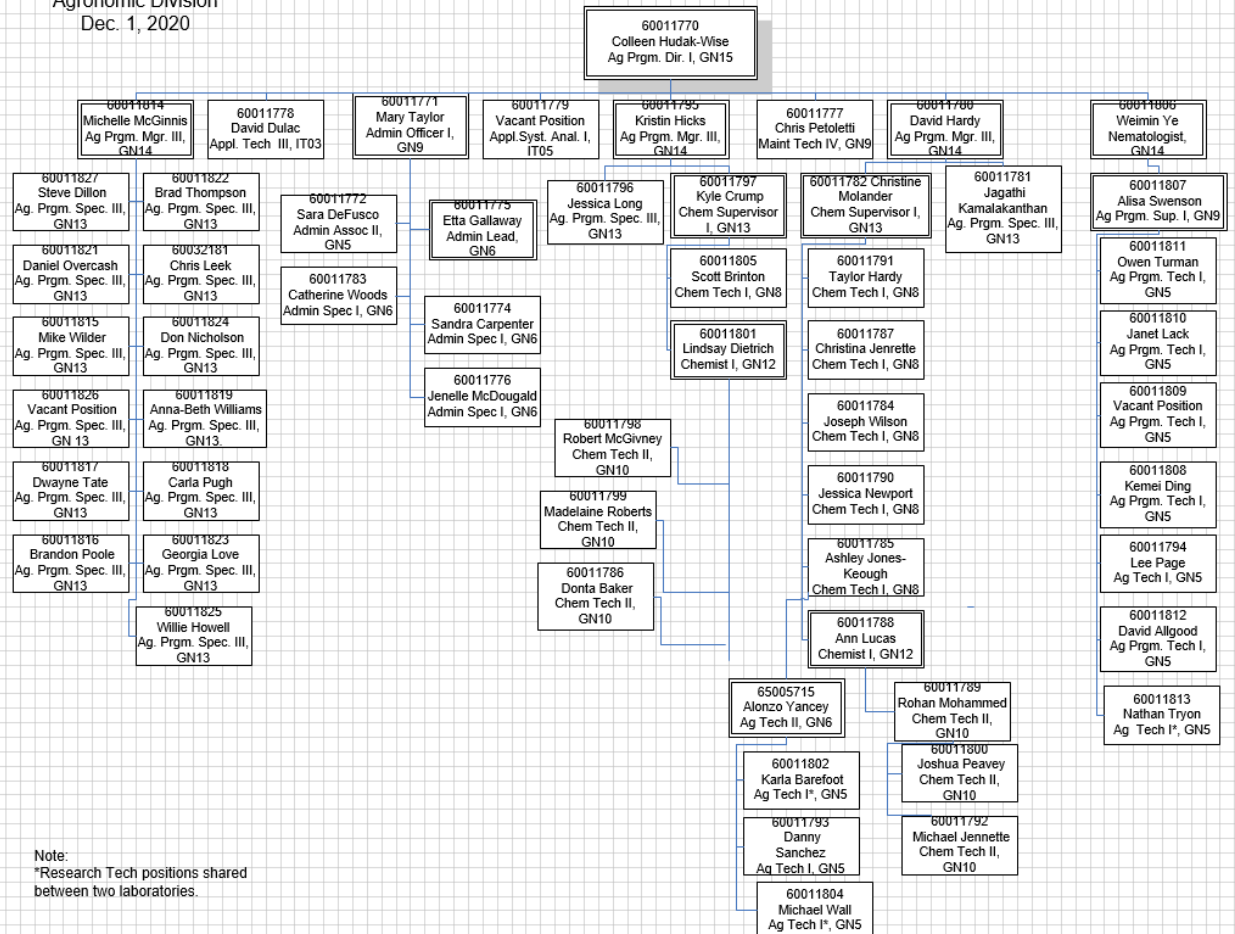
Other notable events for 2020 include

- 1) Participation in the NC Star Public Sector Safety Program for the eleventh year.
- 2) Implementation of Laserfiche scanning for sample information forms and establishment of a repository for document retention.
- 3) Response to COVID-19 pandemic, including initiation of partial teleworking for Raleigh-based employees and adoption of mitigation measures to reduce employees' risk.
- 4) The Nematode Assay Section processed at least 2,000 nematode molecular diagnostic samples for the growers of North Carolina.
- 5) Dr. Michelle McGinnis and the Field Services Section conducted research in conjunction with N.C. State University's Crop and Soil Sciences Department on optimizing nitrogen and potassium rates for industrial hemp production.
- 6) Dr. Kristin Hicks, Plant/Waste/Solution/Media Section Chief continued field research in collaboration with N.C. State University's Crop and Soil Sciences Department on the nitrogen management of malting barley.
- 7) The Soil Testing lab initiated a project with Electrical and Computer Engineering Department at NC State University to develop a robotic soil weighing station through the Senior Design class. The project will be for two years.

Personnel

The Division has 57 full-time permanent positions: 16 office positions, including administrative support, information technology, maintenance, and leadership positions; 28 laboratory staff distributed among three laboratories (Soil Testing, Nematode Assay and Plant/Waste/Solution/Media) and 13 regional agronomists who make up the Field Services Section. Regional agronomists are assigned to territories consisting of 5 to 11 counties; they conduct grower consultations to help diagnose nutrient and/or nematode problems and to offer expert advice regarding plant nutrient management for waste management plans. The Agronomic Services Division's organizational chart and the Field Services Territorial Map, both as of December 1, 2020, follow.

Agronomic Division
Dec. 1, 2020



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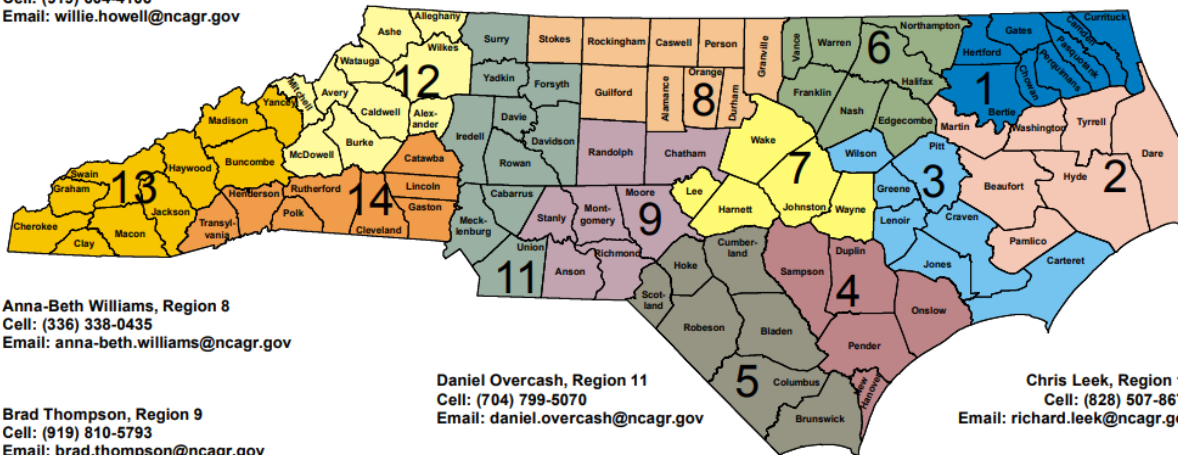
NCDA&CS Agronomic Division Field Services

Dec 2020

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Staff turnover during 2020 included several key positions. The following is a description of the personnel changes that took place during 2020.

Personnel Changes for Calendar Year 2020 (Permanent Staff)

- Agricultural Program Specialist III (Regional Agronomist) - 60011826
October 2020 – Carter Askew resigned
December 2020 – position remains vacant
- Agricultural Program Specialist III (Regional Agronomist) - 60011819
October 2019 - Chris Jernigan transferred to Research Stations
May 2020 – Anna-Beth Williams hired

- Agricultural Technician I – 60011793
December 2019 – Christina Jenrette promoted
April 2020 – Daniel Sanchez hired
- Administrative Officer I -- 60011771
September 2019 – Lori Pfister resigned
January 2020 – Mary Taylor hired
- Administrative Specialist I (Data Entry Lead) – 60011783
November 2019 – Lucy Funicello resigned
March 2020 - Catherine Woods promoted
- Administrative Specialist II (Accounts Receivable) – 60011774
April 2020 – Etta Gallaway promoted
November 2020 – Sandra Carpenter hired
- Administrative Lead – 60011775
February 2020 - Gloria Wilson-Bailey separated
April 2020 – Etta Gallaway promoted
- Administrative Associate II (Receptionist) – 60011772
March 2020 – Catherine Woods promoted
May 2020 – Sara DeFusco hired
- Agricultural Programs Technician I (Nematology Technician) – 60011809
September 2020– Christopher Parker resigned
December 2020 – position remains vacant
- Application Systems Analyst I - 60011779
September 2019 – Jeff Vitalis resigned
December 2020 – position being filled by temp to hire

Funding

The Agronomic Services Division's expenditures for FY2020 were more than \$5.5 million. Sources of funding included State Appropriations, expedited soil shippers, peak-season soil fees, fertilizer and lime taxes and "other" sample fees (nematode, plant, waste, solution, and media samples).

FY2020 Sources of Funding

State Appropriations, \$3,761,178 (68%)

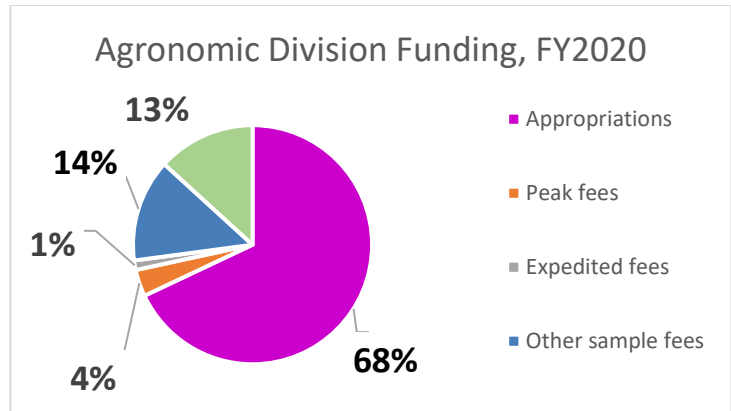
Peak-season Soil Fees, \$200,668 (4%)

Expedited Soil Fees, \$71,000 (1%)

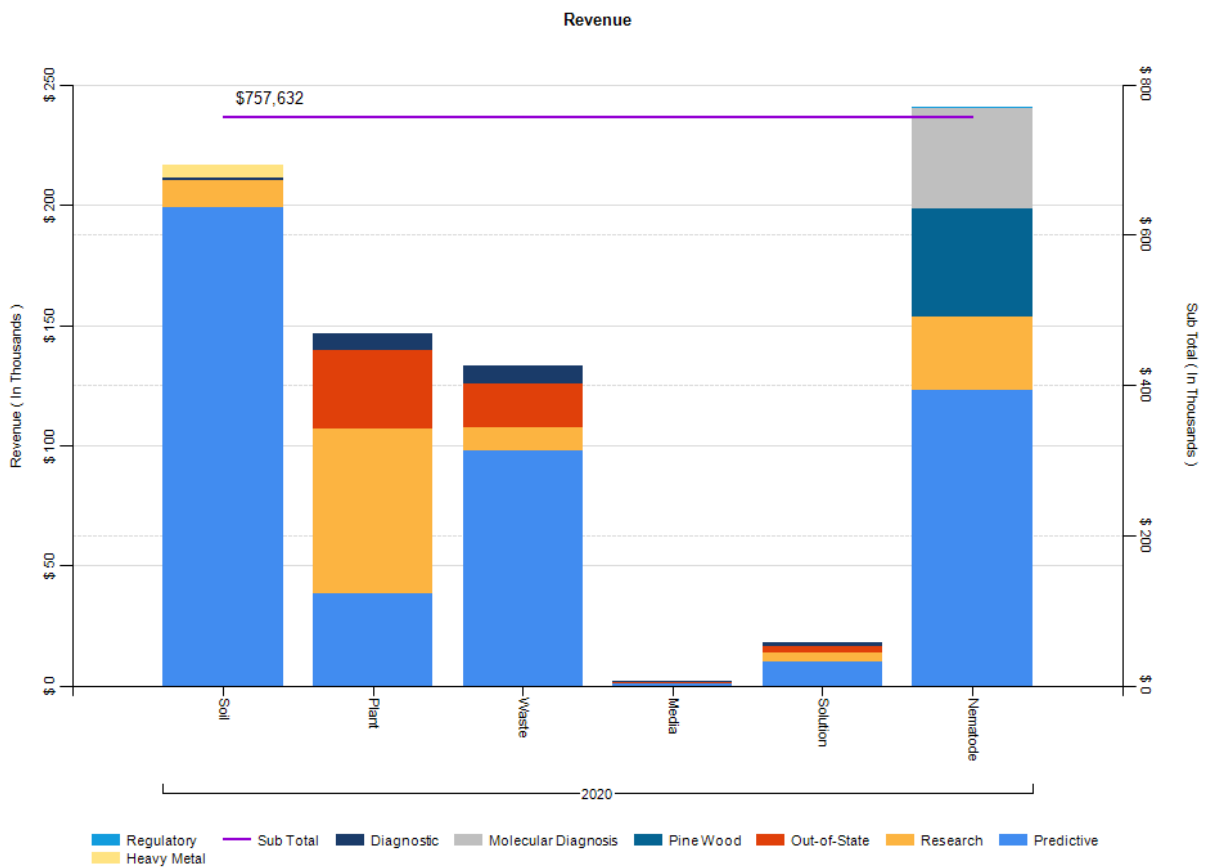
Other Sample Fees, \$768,712 (14%)

Fertilizer & Lime Taxes, \$731,424 (13%)

Total Budget: \$5,532,982



The chart below shows the FY2020 revenue generated by routine samples.



Laboratory Services

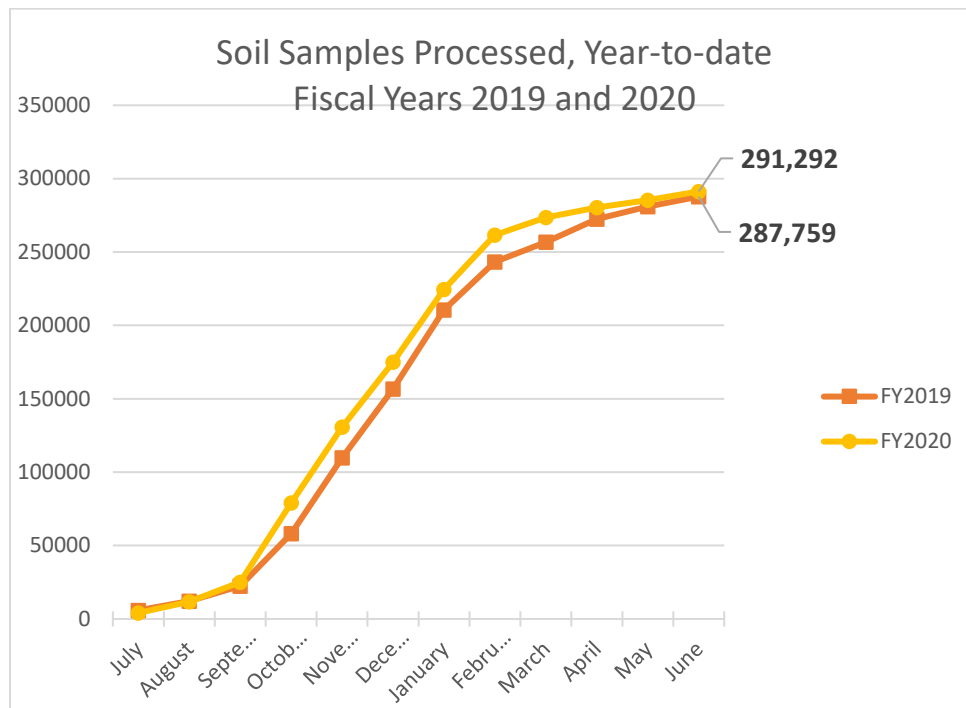
Quality Analysis/Quality Control

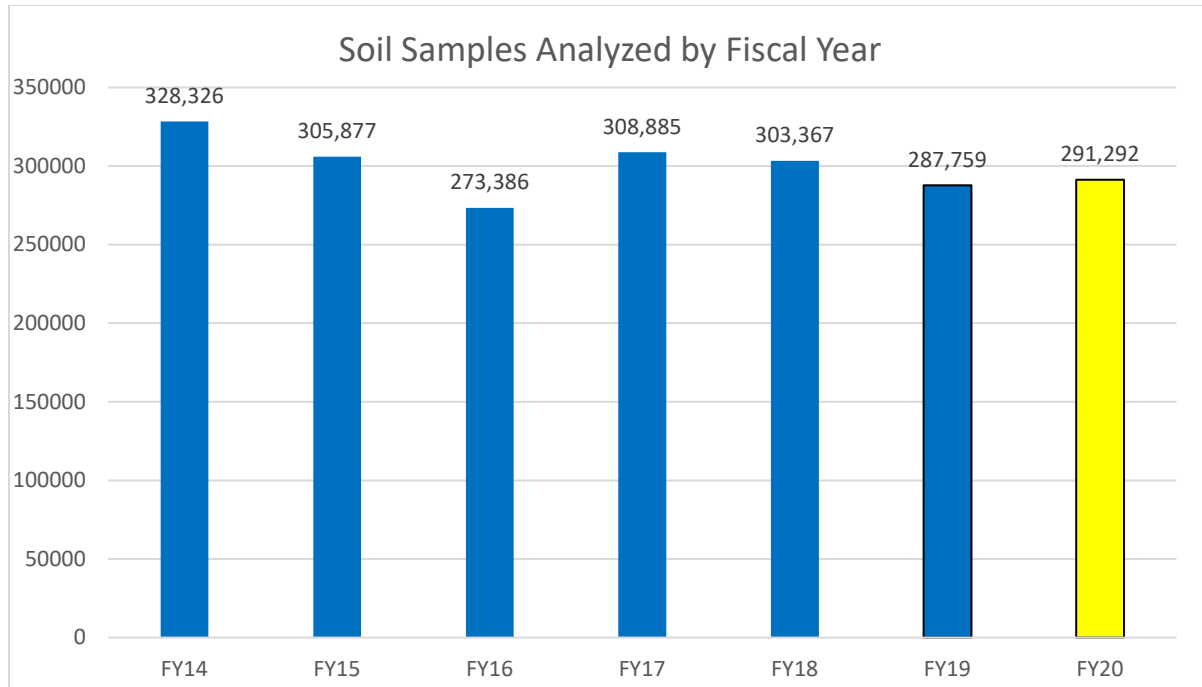
The Soil Testing and Plant/Waste/Solution/Media Advisory Laboratories participate in several external quality control programs. Annual analysis of unknown samples provided by an accredited proficiency testing provider is part of the laboratory recertification process by the Division of Environmental Quality's Division of Water Resources' Laboratory Certification Branch. The Agronomic Division passed its proficiency testing in 2020 and is certified through 2021.

The Agronomic Division also voluntarily participated in the following inter-laboratory, proficiency testing and certification programs during 2020:

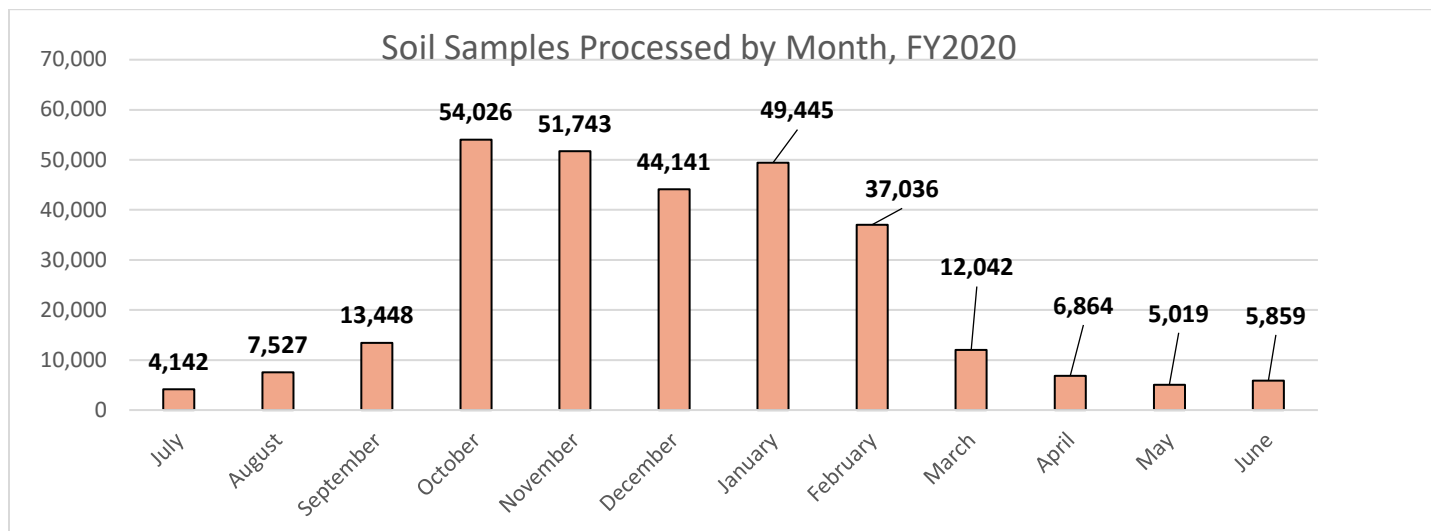
1. North American Proficiency Testing Program (NAPT) – soil and plant tissue analyses
3. Manure Analysis Program (MAP) – manure analyses
4. Agricultural Laboratory Proficiency program (ALP) – soil and plant tissue analyses

The **Soil Testing Section**, under the direction of David H. Hardy, Ph.D., analyzed 291,292 soil samples in FY2020: 281,040 predictive; 1,896 diagnostic; 2,167 research; 5,963 internal; 207 heavy metals; and 19 witchweed. The Soil Testing Lab issued a total of 32,855 reports for fertilizer/lime recommendations. Total sample volume for FY2020 was up about 1.2% compared to the previous fiscal year.

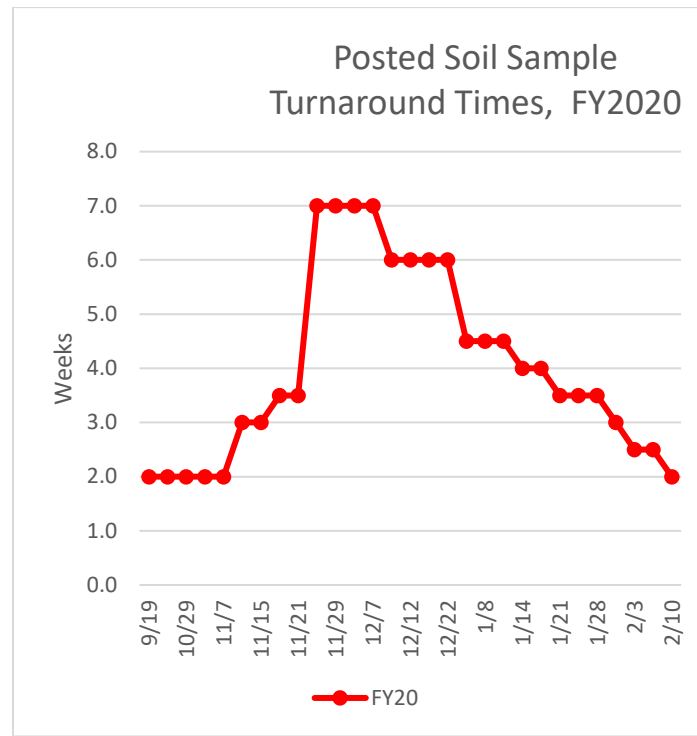




A total of \$200,668 was collected in peak-season soil testing fees (\$4.00/sample) for samples submitted November 27, 2019, through March 31, 2020. Peak-season samples (50,167) represented 18% of the total sample volume analyzed by the Soil Testing Lab. As seen below, the peak-season fee achieved its intended purpose, to distribute the workload for the Soil Testing Lab more evenly across the year. October 2019 was the busiest month of FY2020, with 54,026 soil samples being analyzed.



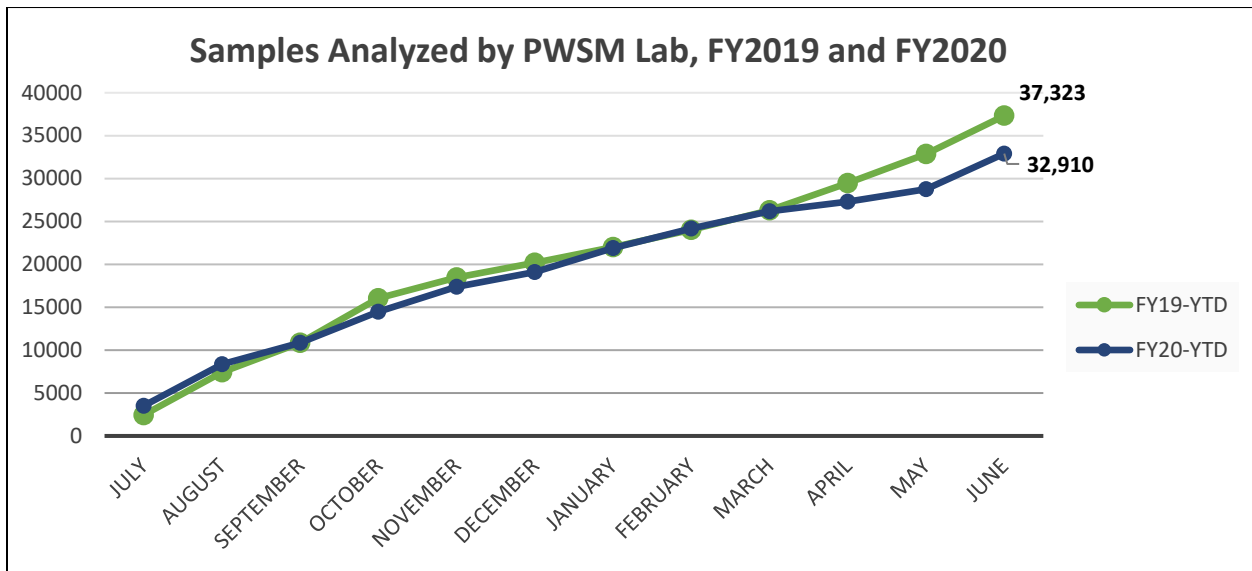
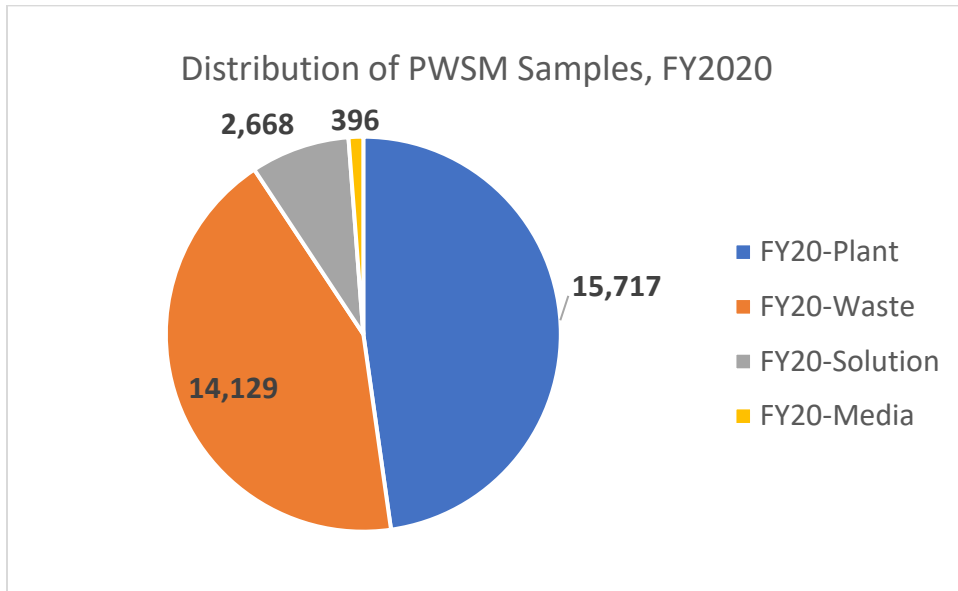
In general, the sample turnaround times were very acceptable for growers during FY2020. Soil sample turnaround for predictive samples plateaued at seven weeks on November 27, 2019 but then dropped back down to two weeks by February 10, 2020.

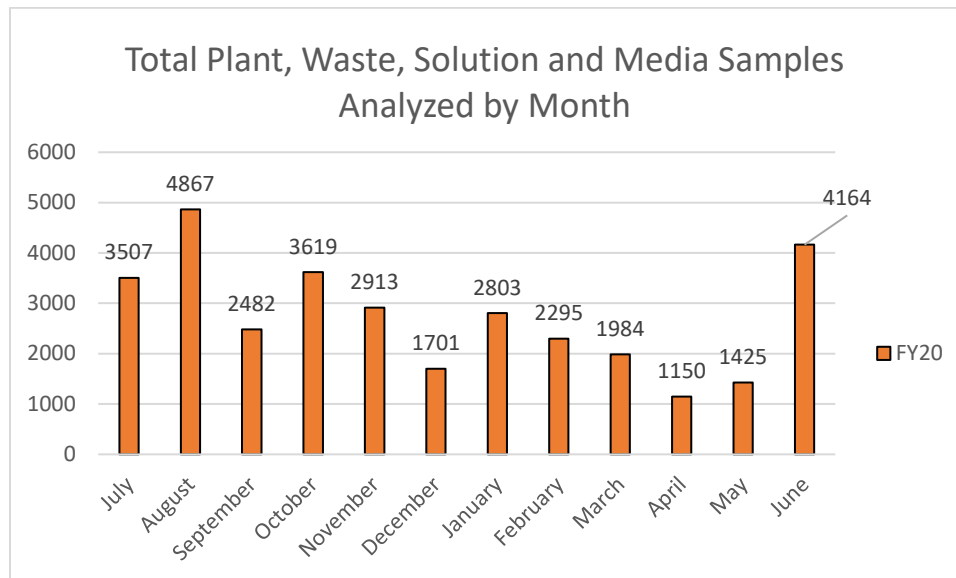
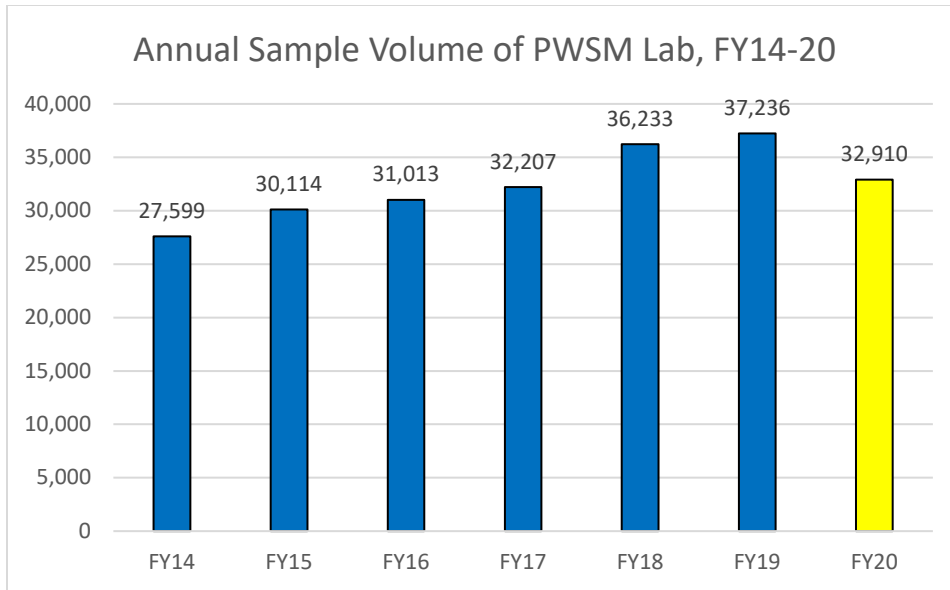


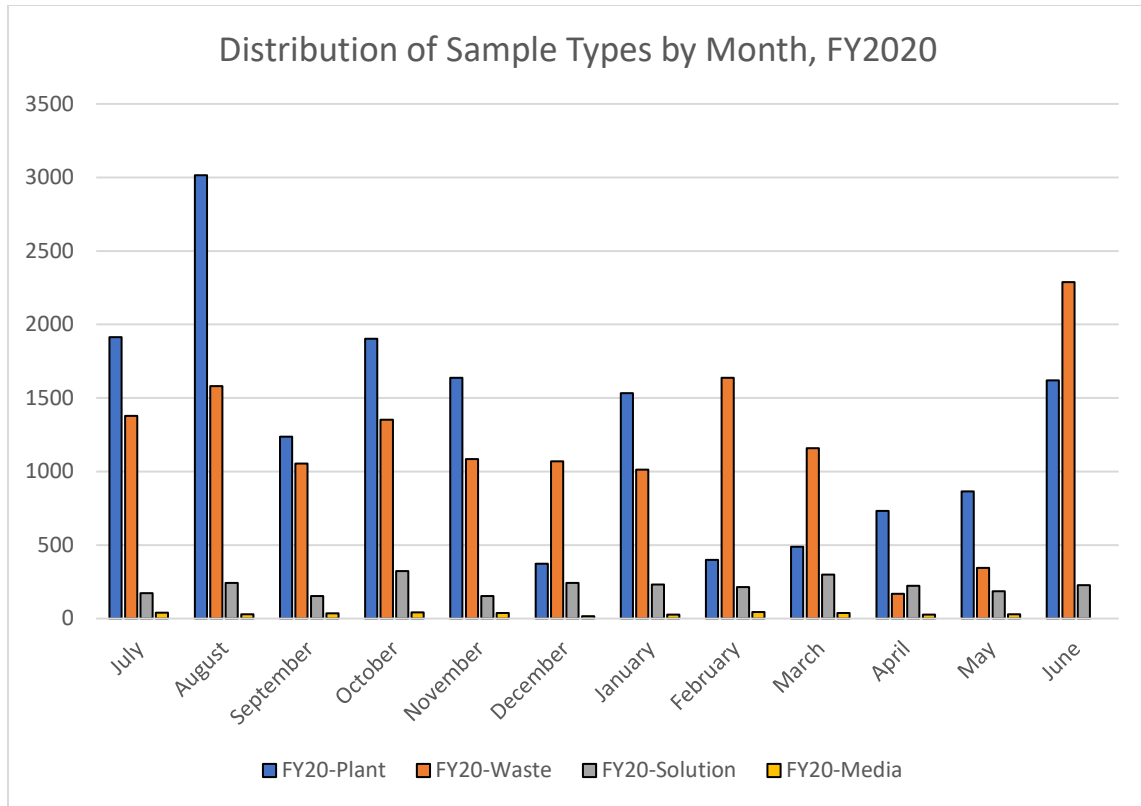
For high-volume customers wanting a guaranteed turnaround time of 7 to 10 business days, a limited number of “expedited shippers” were sold at \$200 each. Each expedited shipper holds 36 soil samples. During FY2020, 355 expedited shippers were sold to clients, with a net revenue of \$71,000.

The **Plant/Waste/Solution/Media (PWSM) Section**, under the direction of Kristin Hicks, Ph.D., issued a total of 10,556 reports during FY2020. These reports gave recommendations for 15,717 (48%) plant tissue samples; 14,129 (43%) waste samples; 2,668 (8%) solution samples; and 396 (1%) soilless media samples in FY2020. Overall, annual sample volume was down about 12%, mainly due to a reduced number of waste samples analyzed during April and May in response to a waiver granted by the Department of Environmental Quality (DEQ) from March 20, 2020, until June 1, 2020, for mandated waste sample collection and analysis for all permitted animal feeding operations. With few exceptions, the following turnaround times were able to be maintained throughout the year: plant, 2 days; media and solution, 3 to 4 days; and waste, 7 to 10 days.

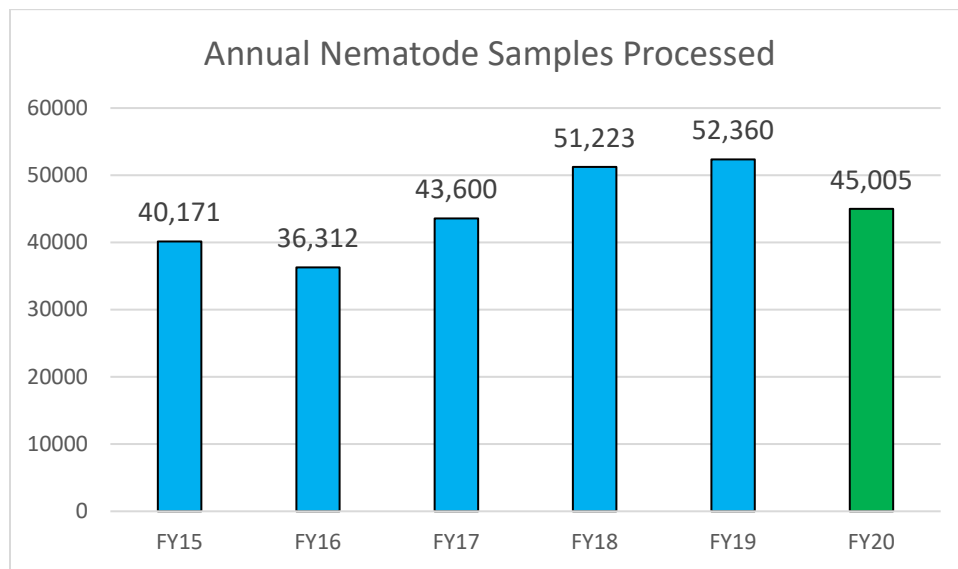
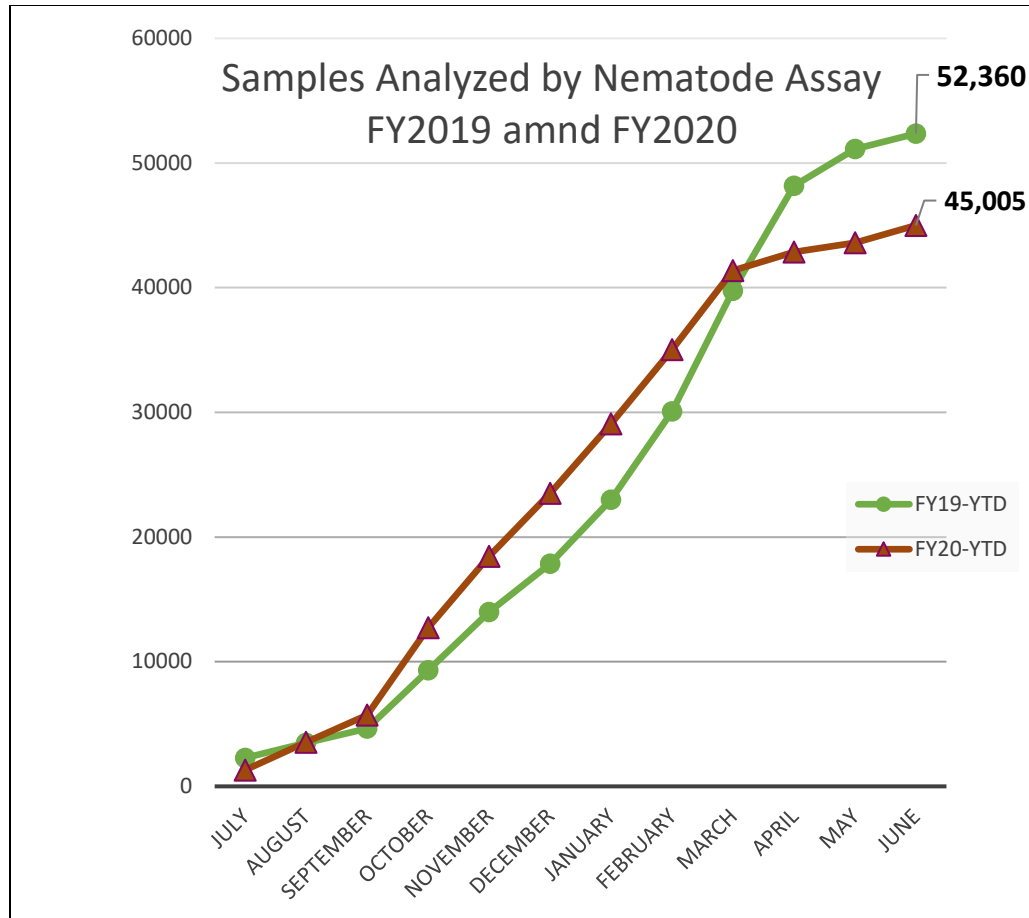
The busiest month for the PWSM Section for FY2020 was August 2019, with 4,867 samples analyzed, followed by June 2020, with 4,164 samples. In total, 32,910 samples were processed during FY2020.

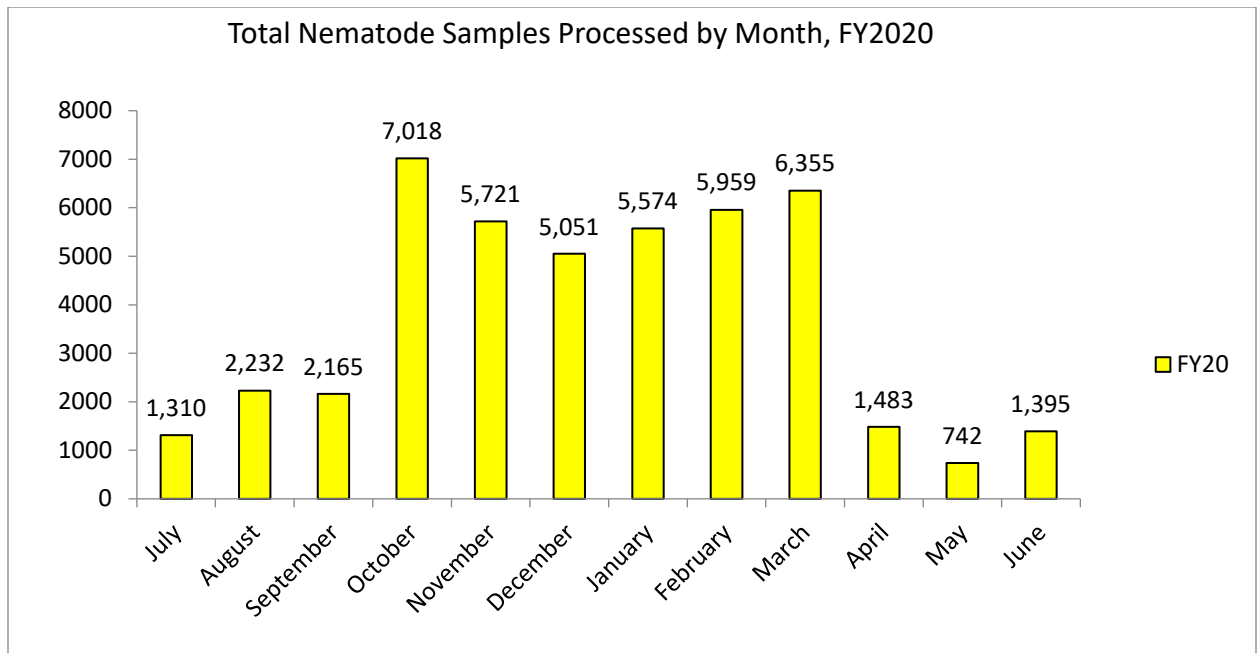






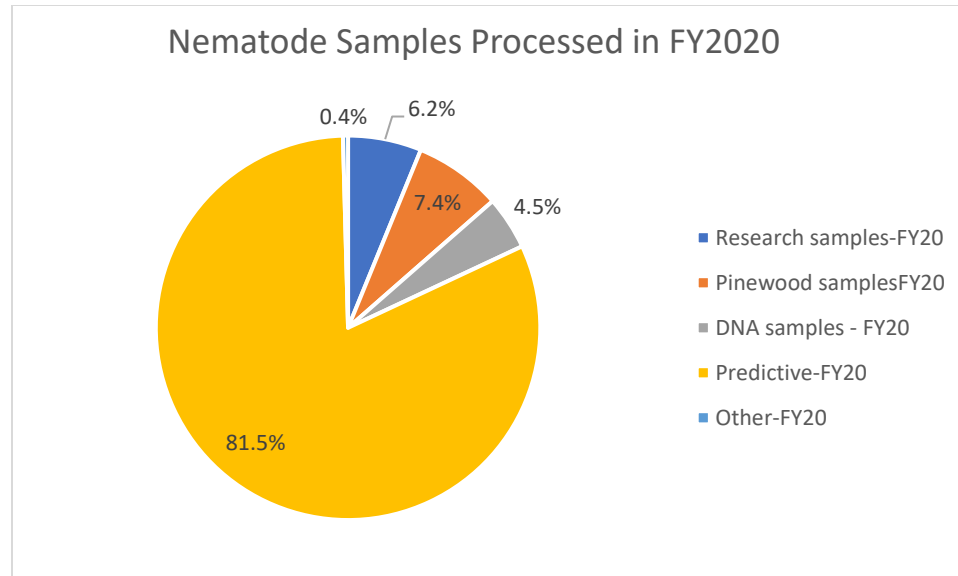
The Nematode Assay Section, under the direction of Weimin Ye, Ph.D., processed 45,005 samples and issued 5,844 reports in FY2020. Sample volume was down about 14% compared to the previous fiscal year, mainly due to lower sample submissions after the start of the COVID-19 pandemic (April – May 2020). Nonetheless, the Nematode Assay Lab had the third highest sample annual sample volume since the lab’s beginning (1975). October 2019 was the busiest month in FY2020 for the lab, with 7,018 samples processed.





Most samples (36,698) were predictive in nature; other types included 2,783 research samples, 62 diagnostic samples, 109 internal samples, 2,018 molecular diagnostic samples and 20 regulatory samples from the NCDA&CS Plant Industry Division.

In addition, 3,315 pine wood samples were specifically tested for the presence of pinewood nematode, so shipments of lumber and wood products could be cleared for export from the United States. Pine wood nematode was detected in 136 samples, but this was only 4.10% of the total pine wood samples assayed. A tariff imposed by China on pinewood imported from the United States has continued to have a negative impact on pinewood samples submitted to the Nematode Assay Lab. Pinewood samples made up 7.4% of all nematode samples processed in FY2020, compared to 16.0% in FY2019 and 27.4% in FY2018. Although most pinewood samples came from North Carolina ports, the Nematode Lab also processed samples from Georgia, Florida, New York, Alabama, and South Carolina, with each out-of-state sample being assessed an additional \$10 surcharge.



In FY2020, the crop with the largest number of submitted samples was sweet potato, with 18,636 samples (41% of total sample volume), followed by soybean (10,008 samples and 22% of total). The top five counties submitting nematode samples for assay were Nash, Johnston, Wayne, Edgecombe, and Wilson Counties, with samples totaling, 8479, 4732, 4416, 3824, and 3801, respectively.

The Nematode Assay Lab processed 59 samples for the NC State University's Plant Disease and Insect Center as part of a long-standing cooperative agreement.

Field Services

Field Services Section personnel, under the direction of Michelle McGinnis, Ph.D., made about 10,000 grower consults in FY2020, primarily to help diagnose nutrient and/or nematode problems. Regional agronomists handled more than 500 inquiries regarding environmental issues in FY2020, primarily waste management plan clarifications, regulatory updates and river basin oversight reviews, and participated in at least 10 county Soil & Water local advisory committees.

Field Services personnel served on 17 agricultural commodity and agricultural organization boards, committees, and advisory groups.

- 1217 Interagency Guidance Committee – Willie Howell
- Buncombe County FARMS Board – Chris Leek
- Corn Growers Association of North Carolina Board – Don Nicholson
- Lee County Farm Bureau Board – Don Nicholson
- Madison County Ag Agencies Board – Chris Leek
- Mountain Research Station Field Day Planning Committee – Chris Leek
- NC Ag Foundation Board – Georgia Love

- NC Certified Crop Advisors Board – Brandon Poole
- NC Certified Crop Advisors Exam Committee – Michelle McGinnis
- NC Raspberry and Blackberry Growers Association Board – Steve Dillon
- NC Tomato Growers Association Board – Chris Leek
- Robeson County Crop Promotion Association Board – Georgia Love
- Robeson County Extension Field Crops Advisory Committee – Georgia Love (Chair)
- Rowan County Extension Advisory Council – Daniel Overcash
- Upper Mountain Research Station Research Greenhouse Facility Advisory Group – Dwayne Tate
- Wayne County Farm Bureau Board – Willie Howell
- Wilkes County/Roaring River Water Quality Initiative Advisory Comm. – Dwayne Tate

Education & Outreach (Fiscal Year 2020)

Agronomic Division staff, especially the Field Services Section, reach thousands of growers and agricultural professionals through a wide range of educational activities. AdvanSix provides funding for the distribution of a limited number of vouchers to cover the cost of plant tissue analysis to introduce growers to this service. Regional agronomists play a key role in spreading the word about tissue testing and offering the free vouchers to interested growers. During fiscal year 2020, the AdvanSix and NCDA&CS Voucher Program funded the nutritional analysis of 151 plant samples, benefitting 68 growers. Of the 151 samples, 94 vouchers were used to pay for 9 field crops and 57 vouchers for 17 horticultural crops

In-house staff conducted at least 25 laboratory tours for farmers, master gardeners, agribusiness groups, scientists and students before tours were suspended in March 2020 due to COVID-19. COVID-19 necessitated most field days, conferences, and other commodity meetings to be held virtually this year. Field Services had a presence at greater than 60 virtually held events during fiscal year 2020. Appendix A lists the events at which the Agronomic Services Division had an educational display.

Outreach also included 8 news releases (Appendix B) and at least 45 presentations on agronomic services were made to master gardeners, growers, commodity associations, conservation groups, and county and state organizations as well as to regional, national, and international meetings (Appendix C). Twelve external professional publications were published by staff during FY2020 (Appendix D).

Research (Fiscal Year 2020)

Division staff routinely engage in cooperative studies with university personnel, farmers and industry specialists. Research conducted in FY2020 includes the following:

- 1) A Lime Laboratory Incubation and Lime Rate Field Study, in cooperation with Crop and Soil Sciences at N.C. State University (NCSU) - Dr. David Hardy (NCDA&CS) and Drs. Carl Crozier, John Havlin and David Jordan (NCSU). Project funding: Agronomic Division.

- 2) Nitrogen Rate Management for Malting Quality Barley in North Carolina in cooperation with the Crop and Soil Sciences Department at N.C. State University (NCSU), Year 3 – Dr. Kristin Hicks (NCDA&CS); Regional Agronomist Brandon Poole (NCDA&CS); Dr. Luciano Gatiboni (NCSU); Dr. Deanna Osmond (NCSU) and Graduate Student Josh Whelan (NCSU). Project funding: N.C. Tobacco Trust Fund Commission
- 3) Fertility of double-cropped, primocane-fruiting blackberries in collaboration with the Crop and Soil Sciences Department at N.C. State University (NCSU), Year 2 – Dr. Kristin Hicks (NCDA&CS); Regional Agronomist Steve Dillon (NCDA&CS); and Dr. Gina Fernandez (NCSU).
- 4) Molecular Characterization and Diagnosis of Root-knot Nematodes (*Meloidogyne* spp.) from North Carolina – Dr. Weimin Ye (NCDA&CS).
- 5) Pine wood nematode fumigation study on wood chips in Savannah Georgia – Dr. Weimin Ye (NCDA&CS).
- 6) Nitrogen and potassium rates for industrial hemp production in cooperation with the Crop and Soil Sciences Department at N.C. State University (NCSU) – Dr. Michelle McGinnis (NCDA&CS); Dr. Loren Fisher (NCSU); Dr. Keith Edmisten (NCSU). Dr. Matthew Vann (NCSU) and Maggie Short (NCSU). Project funding: New and Emerging Crops Grant.
- 7) Effect of drying temperature on cannabinoid concentrations, mycotoxin levels, and yeast & mold levels of hemp grown for CBD extraction in cooperation with the Crop and Soil Sciences Department at N.C. State University (NCSU) – Dr. Michelle McGinnis (NCDA&CS); Brandon Poole (NCDA&CS), and Dr. Keith Edmisten (NCSU). Project funding: New and Emerging Crops Grant.

Safety Program

The Agronomic Services Division maintains a very active, employee-led safety program. The Division has been recognized as a Public-Sector Star site by the North Carolina Department of Labor (NCDOL) for the past eleven years. All employees serve on one of eight Star safety teams: Safety Inspection & Compliance; Safety Program & Policy; Safety Information & Communication; Job Safety Analysis; Housekeeping and Wellness; Ergonomics; Environmental Management and Field Services.

The Agronomic Services Division prepared a detailed annual report on its 2020 safety program and submitted it to the N.C. Department of Labor (NCDOL) on February 15, 2021. (Reports are prepared according to the calendar year per NCDOL guidelines.) There were no recordable Workman Comp cases took place during 2020.

Appendix A. Educational Exhibits for Fiscal Year 2020

FY 2020 Educational Exhibits	Date
Blacklands Farm Managers Tour (Fairfield)	Aug 7, 2019
NC Christmas Tree Association Summer Meeting (Newland)	Aug 16-17, 2019
NC Greenhouse Vegetable Growers Association (Raleigh)	Oct 29-30, 2019
Sustainable Ag Conference	Nov 1-3, 2019
SE Strawberry Expo (Raleigh)	Nov 6-8, 2019
SE Vegetable & Fruit Expo (Wilmington)	Dec 5-7, 2019
NC Apple Growers Meeting (Asheville)*	Jan 7-8, 2020
NC Commodities Conference (Durham)	Jan 8-10, 2020
SE Regional Fruit and Vegetable Conference (Savannah)	Jan 10-12, 2020
NC Blueberry Council Open House and Trade Show (Fayetteville)	Jan 14-15, 2020
Green & Growin' Show (Greensboro)	Jan 29-31, 2020
Southern Farm Show (Raleigh)	Feb 5-7, 2020
Organic Commodities & Livestock Conference (Mt. Olive)	Feb 13, 2020
Winter Vegetable/Tomato Conference (Asheville)	Feb 19-20, 2019
NC Peach Society Annual Meeting (Carthage)*	Jan 23, 2020
NC Christmas Tree Association Winter Meeting (Blowing Rock)*	Feb 21-22, 2020

Appendix C. News Releases and Interviews for Fiscal Year 2020

	News Release/Interview	Date
1.	<i>Price to increase Nov. 1 on nematode molecular diagnostic testing, Colleen Hudak-Wise</i>	Oct. 9, 2019
2.	<i>Agronomic Services Division offers nematode molecular diagnostic testing, Weimin Ye</i>	Nov. 8, 2019
3.	<i>Reminder: Peak-season soil testing period opens Nov. 27, David Hardy</i>	Nov. 26, 2019
4.	<i>Now is the time for tobacco transplant producers to test float bed water, Kristin Hicks</i>	Feb. 11, 2020
5.	<i>NCD&CS employees donate equipment to local hospital in NCD&CS in the Field blog, Joey Pitchford</i> http://info.ncagr.gov/blog/2020/04/06/ncdacs-employees-donate-equipment-to-local-hospital/	April 6, 2020
6.	<i>How to use previous soil test results for yards and home gardens, David Hardy</i>	April 8, 2020
7.	<i>Understanding nitrogen needs of plants from fertilizers, Jagathi Kamalakanthan</i>	June 3, 2020
8.	<i>North Carolina Department of Agriculture Releases New Soil Nutrient and Leaf Tissue Sampling Guidelines in Hemp Grower.</i> https://www.hempgrower.com/article/north-carolina-department-agriculture-new-hemp-soil-nutrient-testing-guidelines , Michelle McGinnis and N. Skodzinski.	June 9, 2020

Appendix D. Presentations for Fiscal Year 2020

Soil Testing Section

- 1) Soil Science Society of NC 63rd Annual Meeting, Presentation: *A Historical Perspective on Development of the NCDA Soil Test Laboratory*, January 22, 2020. D. Hardy
- 2) Spring 2020 Pitch to Electrical and Computer Engineering Senior Class, NC State University, Presentation: *Soil Testing Needs as Related to Automation*, January 22, 2020, D. Hardy
- 3) Green and Growin'20 Show, Presentation: *Soil Fertility Management for Successful Lawns*, January 29, 2020. D. Hardy
- 4) Mid-Atlantic Giant Pumpkin & Watermelon Meeting, Presentation: *Understanding the Soil Test in North Carolina*, February 15, 2020, D. Hardy
- 5) Mid-Atlantic Soil Testing and Plant Analysis Workgroup 2020 Meeting, Presentation: *North Carolina's Soil Testing Recommendations --- Pieces of the Puzzle as to their Origin*, February 12, 2020. D Hardy
- 6) 2020 ASA, CSA, SSSA. International Annual Meeting, Virtual Presentation: *The Simplicity and Complexity of Soil pH Measurement*, SSSA pH & Soil Acidity Symposium, November 10, 2020, D. Hardy

Plant/Waste/Solution/Media Section

- 1) North American Raspberry and Blackberry Association Meeting; 2021 Southeast Regional Fruit & Vegetable Conference (Virtual; January 5, 2021)
Presentation: *Plant Tissue Analysis for Managing Fertility in Blackberry*, K. Hicks
- 2) NCSU 2021 Strawberry School (Virtual; March 18, 2021) Presentation: *Managing Fertility in Strawberry with Plan Tissue Testing*, K. Hicks
- 3) Southern Extension and Research Activity Information Exchange Group 6 Joint Regional Meeting (Virtual; June 29, 2021) Presentation: *Recommended Sufficiency Ranges for Cannabis sativa in North Carolina*, K. Hicks

Nematode Assay Section

- 1) 58th Annual Meeting of the Society of Nematologists (Raleigh, NC; July 8-11, 2019)
Presentation: *Characterization of an emerging root-knot nematode Meloidogyne enterolobii in North Carolina, USA*, W. Ye
- 2) APS Southern Division 2020 Annual Meeting. The American Phytopathological Society (APS). (Charleston, South Carolina, February 9-12, 2020)
Presentation: *Occurrence of the root-knot nematode Meloidogyne enterolobii infecting sweetpotato in North Carolina, United States*, W. Ye

Field Services Section (FY2020)

- 1) Mountain Research Station Specialty Crops Field Day (Waynesville; Jul 18, 2019)
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- Field Demonstration: Tissue and Soil Sampling, D. Tate and C. Leek
- 2) Mountain Research Station Specialty Crops Field Day (Waynesville; Jul 18, 2019)
Presentation: Soil Sampling and How to Interpret Results, C. Leek
 - 3) Mountain Research Station Field Day (Waynesville; Jul 18, 2019)
Field Demonstration: Drill Calibration Demo, C. Leek
 - 4) Harnett County Hemp Meeting (Lillington; Aug 15, 2019)
Agronomic Concerns in Hemp, D. Nicholson
 - 5) NC Christmas Tree Association Summer Meeting (Newland; Aug 16, 2019)
Presentation: Lowering pH in Fraser for Phytophthora Control, D. Tate and J. Moody
 - 6) Hemp Field Day (Salisbury; Aug 27, 2019)
Presentation: Plant Tissue Analysis, M. McGinnis
 - 7) Nash Strawberry Pre-Plant Meeting (Nashville; Aug 29, 2019)
Panel Member: Strawberry Fertility, B. Poole
 - 8) Extension Agent Hemp Training (Wake; Aug 30, 2019)
Presentation: Tissue Sampling and Nutrient Deficiencies, B. Poole
 - 9) Brunswick County Master Gardener Soil Class (Bolivia; Sep 11, 2019)
Presentation: Soils and Soil Fertility for Homeowners, G. Love
 - 10) Caswell County Cattleman's Association (Yanceyville; Sep 17, 2019)
Presentation: Managing Forage Fertility, B. Poole
 - 11) Person County Hemp Field Day (Roxboro; Sep 18, 2019)
Presentation: Hemp Fertility and Most Prevalent Diseases, B. Poole
 - 12) Rowan County Hemp Field Day (Salisbury; Sep 25, 2019)
Presentation: The Good and The Bad of Growing Hemp, D. Overcash
 - 13) Hoke County Master Gardener Soil Class (Raeford; Sep 26, 2019)
Presentation: Soils and Soil Fertility for Homeowners, G. Love
 - 14) Science of Hemp (Lexington KY; Oct 10-11, 2019)
Poster: Foliar Nutrient Concentration of Floral Hemp Cultivars Compared to Published Nutrient Survey Values, M. McGinnis
 - 15) Horse Pasture Workshop (Durham; Nov 02, 2019)
Presentation: Pasture Fertility, B. Poole
 - 16) Amazing Grazing Conference (Nashville; Nov 04, 2019)
Presentation: Pasture / Forage Fertility, M. Wilder
 - 17) NRCS Stanly County Field Day (Albemarle; Nov 04, 2019)
Presentation: Soil Sampling in Pastures, D. Overcash

- 18) Central Carolina Community College (Pittsboro; Nov 13, 2019)
Presentation: Understanding Your Soil Report, B. Thompson
- 19) Amazing Grazing Pasture Training (Morganton; Nov 15, 2019)
Presentation: Soil Fertility Considerations for Pasture Renovation, D. Tate
- 20) Rowan Co Cattlemen's Association (Salisbury; Dec 05, 2019)
Presentation: Nutrient Management in Grazing Pastures, D. Overcash
- 21) NCVG Ag Expo (Wilmington; Dec 7, 2019)
Presentation: Floral Hemp Fertility Management with Plant Tissue Analysis, M. McGinnis
- 22) NC Vegetable Growers & NC Agribusiness Council Ag Expo (Wilmington; Dec 07, 2019)
Presentation: Floral Hemp Fertility Management with Plant Tissue Analysis, M. McGinnis
- 23) Ag-Pro Day (Goldsboro; Dec 11, 2019)
Presentation: Agronomic Considerations in Landscapes, D. Nicholson
- 24) Rowan Winter Hemp Meeting (Salisbury; Dec 16, 2019)
Presentation: The Good the Bad and the Money of Hemp, D. Overcash
- 25) Sampson County CES Animal Waste Operator Class (Clinton; Dec 17, 2019)
Presentation: Animal Waste Management: Tools to Maintain a Healthy Crop, W. Howell
- 26) Bladen Voluntary Ag District Meeting (Elizabethtown; Jan 23, 2020)
Presentation: 2019 Hemp Production Season and Looking Ahead, G. Love
- 27) Northampton County Cotton Meeting (Jackson; Jan 30, 2020)
Presentation: Agronomic Services, M. Wilder
- 28) Bladen Waste Applicator Training (Elizabethtown; Jan 31, 2020)
Presentation: Tools for The Plan: Waste, Soil, and Plant Analysis, G. Love
- 29) Surry County Master Gardeners (Dobson; Feb 11, 2020)
Presentation: Soil sampling and interpretation, D. Overcash
- 30) NCA&T Hemp Conference (Greensboro; Feb 11, 2020)
Presentation: Floral Hemp Fertility and Plant Nutrition, M. McGinnis
- 31) UVM Industrial Hemp Conference (Burlington, VT; Feb 20, 2020)
Presentation: Overview of Floral Hemp Fertility and Production in North Carolina, M. McGinnis
- 32) UVM Industrial Hemp Conference (Burlington, VT; Feb 20, 2020)
Presentation: Floral Hemp Fertility and Plant Nutrition Nitrogen and Potassium Rate Study and Foliar Nutrient Survey, M. McGinnis

- 33) Hoke County Livestock Association Meeting (Raeford; Feb 11, 2020)
Presentation: Nutrient Management with Manure and Other Fertilizer Sources, G. Love

- 34) Scotland County Master Gardener Soil Class (Laurinburg; Mar 12, 2020)
Presentation: Soils and Soil Fertility for Homeowners, G. Love

Appendix E. Professional Publications (External) for Fiscal Year 2020

Soil Testing Section

1. Gatiboni, L, D. Hardy, D. Osmond , J. Havlin. 2020. Calculating the rate of acidifiers to lower the pH of North Carolina soils, <https://content.ces.ncsu.edu/calculating-the-rate-of-acidifiers-to-lower-the-ph-of-north-carolina-soils>. NC State SoilFacts.
2. Jordan, D., D. Hardy, S. Barnes, T. Corbett. 2020. Potential economic value for peanut by increasing soil pH in North Carolina. Crop, Forage and Turfgrass Management. Crop Management Briefs. <https://doi.org/10.1002/cft2.20012>

Plant/Waste/Solution/Media Section

1. Kalinowski J, Edmisten K, Davis J, McGinnis M, Hicks K, Cockson P, Veazie P, Whipker BE. Augmenting Nutrient Acquisition Ranges of Greenhouse Grown CBD (Cannabidiol) Hemp (*Cannabis sativa*) Cultivars. Horticulturae. 2020; 6(4):98.
2. Vann, M, M. McGinnis, K. Hicks. May 1, 2020. Producing Conventional Tobacco Transplants in Greenhouses—Water Quality. NCSU Extension Bulletin AG-488-03. <https://content.ces.ncsu.edu/producing-conventional-tobacco-transplants-in-greenhouses-water-quality>.
3. Thiessen, L., T. Schappe, S. Cochran, K. Hicks, A. Post. Surveying for Potential Diseases and Abiotic Disorders of Industrial Hemp (*Cannabis sativa*) Production Plant Health Progress. August 27, 2020: 21(4)

Nematode Assay Section

1. Mc Groary, P., Ye, W. & Nangle, E. 2020. First report of the sting nematode *Belonolaimus longicaudatus* infecting bermudagrass in Barbados. Journal of Nematology 52 (e2020-21): 1-2. DOI: 10.21307/jofnem-2020-021
2. Jalalinasab, P., Esmaeili, M., Ye, W. & Heydari, R. 2020. Description of *Deladenus gilanica* n. sp. (Hexatyline: Neotylenchidae) isolated from wood of black pine in Northern Iran. Journal of Nematology 52 (e2020-65): 1 - 10. DOI: 10.21307/jofnem-2020-065

3. Davies, K.A., Bartholomaeus, F., Li, D.M., Zhao, Z.Q., Ye, W., & Giblin-Davis, R. 2020. *Schistonchus macrophylla* (Nematoda: Aphelenchoididae): an enigmatic taxon from sycones of *Ficus* section *Malvanthera* in eastern Australia, with description of a new subspecies. *Nematology* 22 (9): 999-1013. <https://doi.org/10.1163/15685411-bja10007>
4. Schwarz, T., Li, C., Ye, W. & Davis, E. 2020. Distribution of *Meloidogyne enterolobii* in eastern North Carolina and comparison of four isolates. *Plant Health Progress* 21: 91 - 96. <https://doi.org/10.1094/PHP-12-19-0093-RS>
5. Zhao, X., Zhang, D., Zeng, W., Huang, J., Zeng, Y., Peng, Y., Huang, J., Ye, W., Ye, Y. & Giblin-Davis, R.M. 2020. *Martininema semicordatae* n. sp. (Nematoda: Aphelenchoididae) associated with *Ficus semicordata* in China. *Nematology* 22 (7): 759–770. <https://doi.org/10.1163/15685411-00003338>

Field Services Section

1. Kalinowski J, Edmisten K, Davis J, McGinnis M, Hicks K, Cockson P, Veazie P, Whipker BE. Augmenting Nutrient Acquisition Ranges of Greenhouse Grown CBD (Cannabidiol) Hemp (*Cannabis sativa*) Cultivars. *Horticulturae*. 2020; 6(4):98.
2. Vann, M, M. McGinnis, K. Hicks. May 1, 2020. Producing Conventional Tobacco Transplants in Greenhouses—Water Quality. NCSU Extension Bulletin AG-488-03. <https://content.ces.ncsu.edu/producing-conventional-tobacco-transplants-in-greenhouses-water-quality>.