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EXTENSION

Getting Started in Soil Fertility Mapping & Resources Available within UGA Extension

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Utilizing Precision Ag Technology Workshop

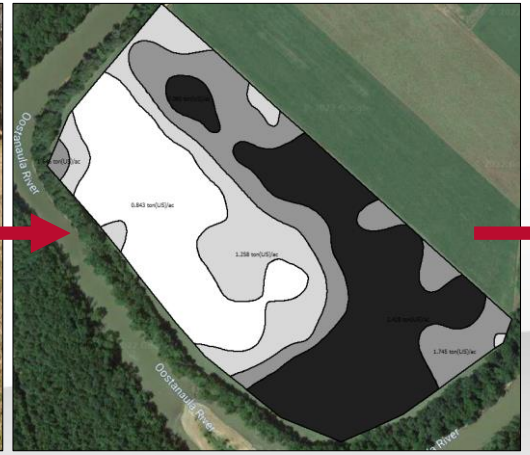
Disclaimer

Reference to a particular software or product does imply an endorsement of that product

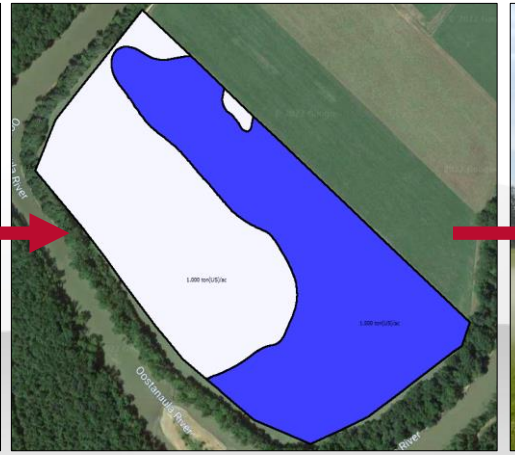
Variable-Rate Nutrient Management Process

Define sampling locations

Collect soil samples



Map soil characteristics (soil nutrient content)



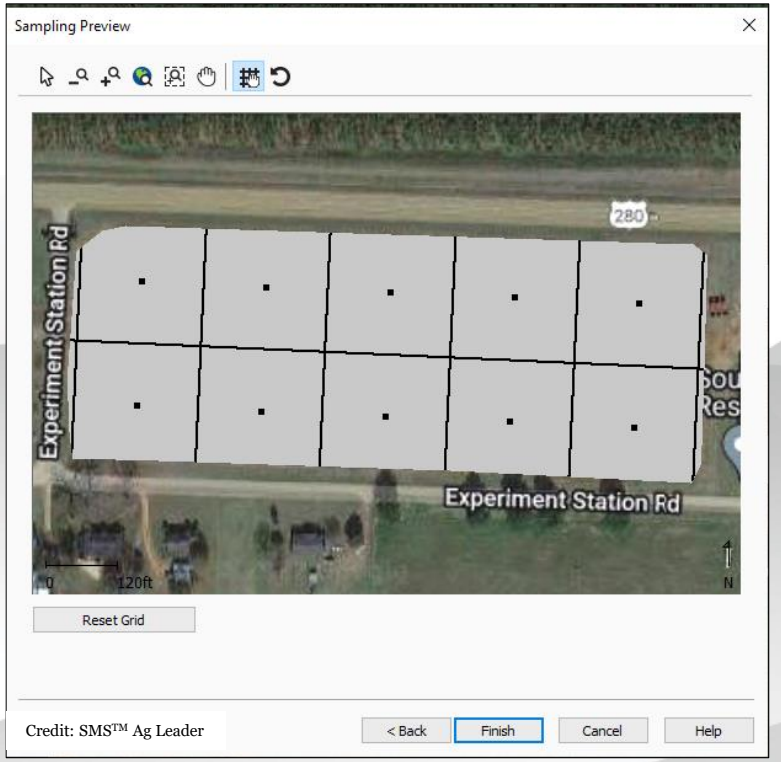
Map prescription rates (nutrient recommendations)

Make variable-rate applications

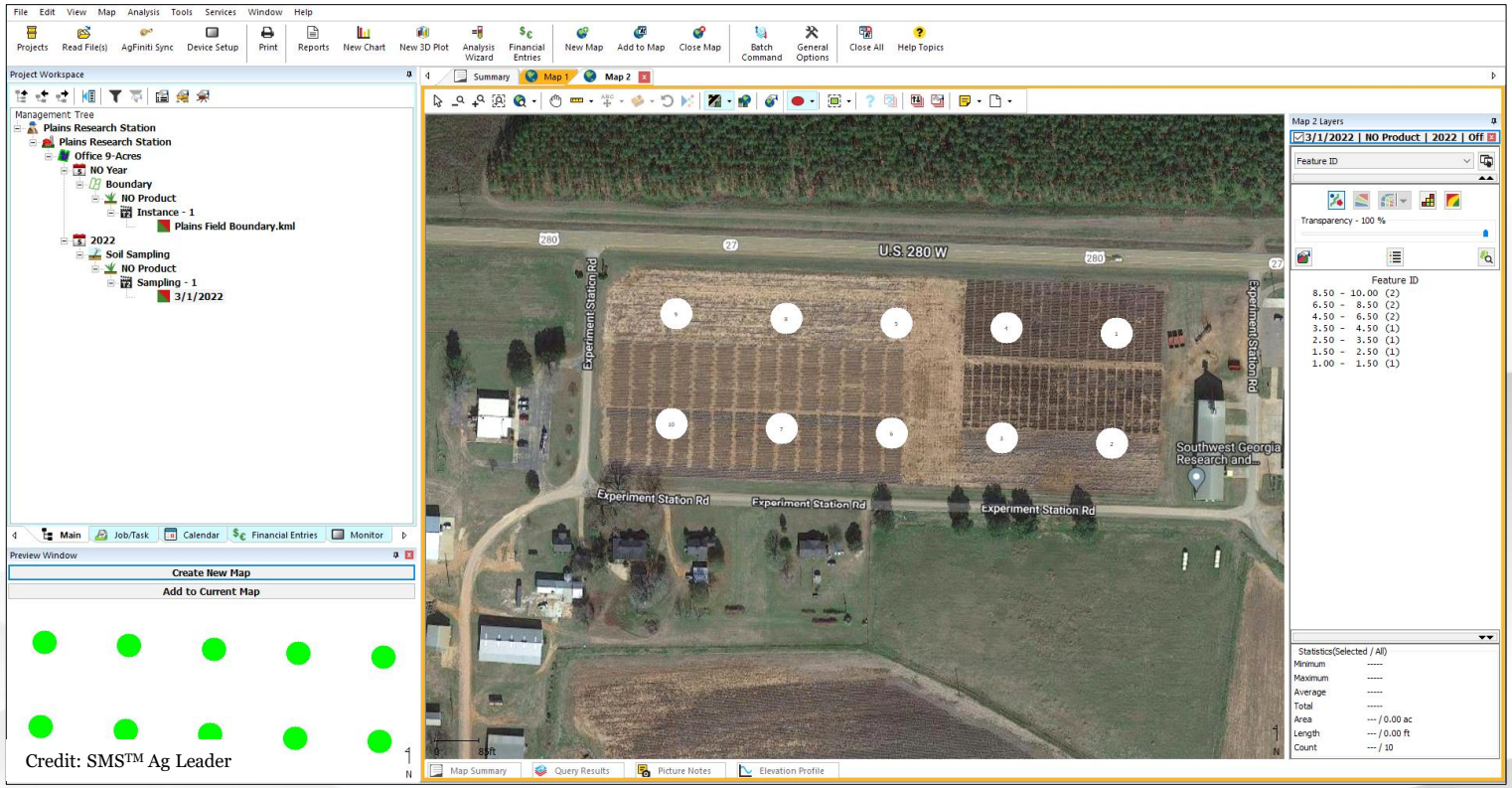
Defining Sampling Locations

- Unlike traditional composite soil sampling, precision ag uses technology to identify sampling locations (grid points, grids, or zones).

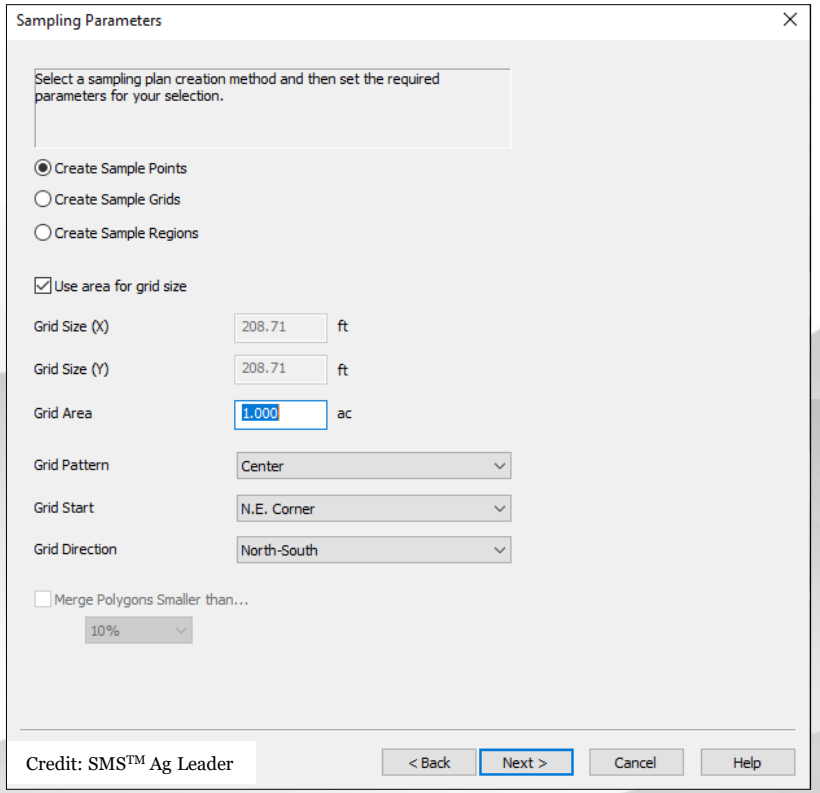
- Uses Ag GIS software, mobile apps, or mapping programs to specify sampling locations (GPS coordinates)



Ag GIS Software



Credit: SMS™ Ag Leader



Credit: SMS™ Ag Leader

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Ag GIS Software

Advantages:

- Fully integrated
  - Sampling, mapping, yield monitoring, reporting
- Many come with mobile/ tablet apps
- Data repository
- May wirelessly connect to equipment
- May support other aspects of farm operations
  - Chemical/supply inventory
  - Expense/budget monitoring
  - Satellite imagery

Disadvantages:

- Expensive ($2,000->$5,000 per year)
  - Some have per acre charges and/or user fees in addition to annual license fee

Examples:

- Agrian- Telus
- Ag Studio- Granular
- Farmer Pro- Trimble
- FieldAlytics- EFC Systems
- FieldView-Climate
- Operations Center- John Deere
- SMS- Ag Leader
- Many more

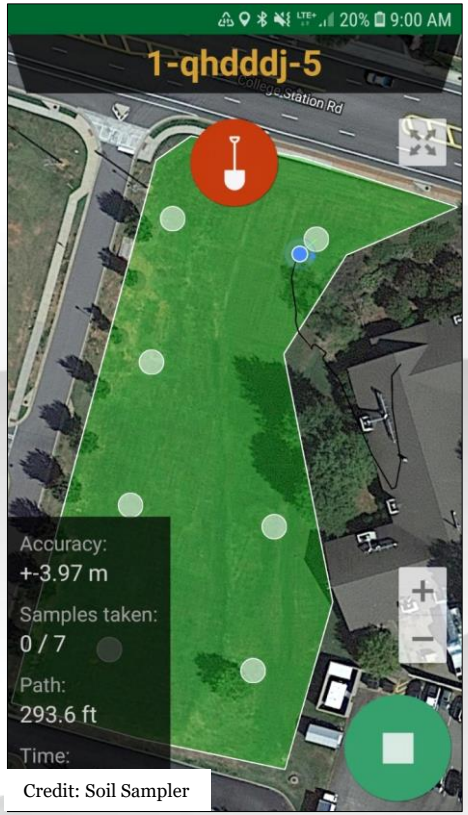
Ag GIS Software

- Considerations when selecting an Ag GIS software:
  - Cost/ fee structure
  - Functions/tasks
  - Equipment supported
  - Platforms (desktop, mobile, tablet)
  - Size of your operation (acres)
  - Cloud, web, or desktop based
  - # of users
  - Technical support

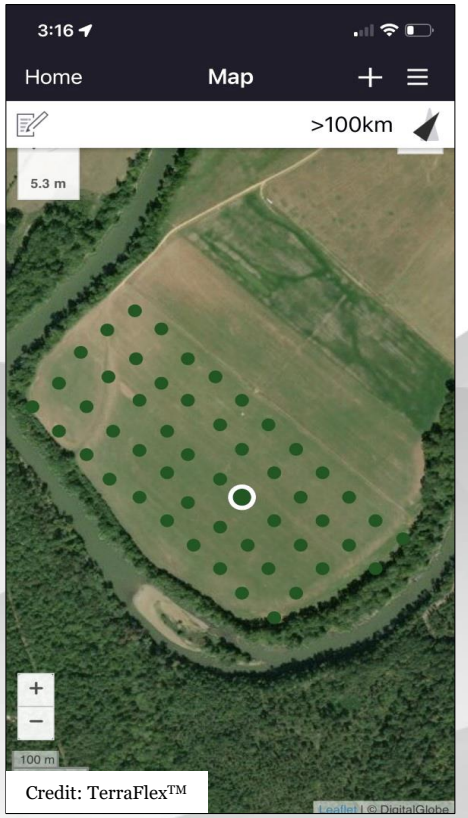
Credit: Trimble® Ag Software

Soil Sampling: Low Cost/No-Cost Options

- Mobile Apps:
  - Soil Sampler (Andriod only)
  - TerraFlex (subscription based)
  - Traction (subscription based)
  - Soil Test Pro (associated with specific labs)
  - AgPhD (associated with specific labs)
  - Many more



Credit: Soil Sampler



Credit: TerraFlex™

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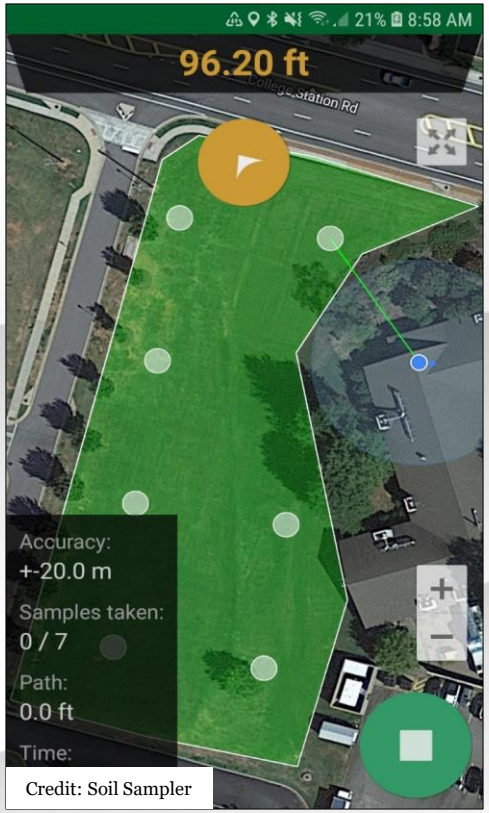
Soil Sampling: Low Cost/No-Cost Options

- Mapping Software:
  - Record Location (coordinates):
    - Apple Maps
    - Google Maps
  - Create Maps (shape files):
    - Google Earth Pro
    - ArcGIS (experience and license required)

Credit: Google Earth Pro

Field Data/Sample Collection

- Mobile phone
  - Some apps requires cell service
  - 3-5 meter accuracy
- Tablet
  - Requires GPS receiver
  - <3 meter accuracy



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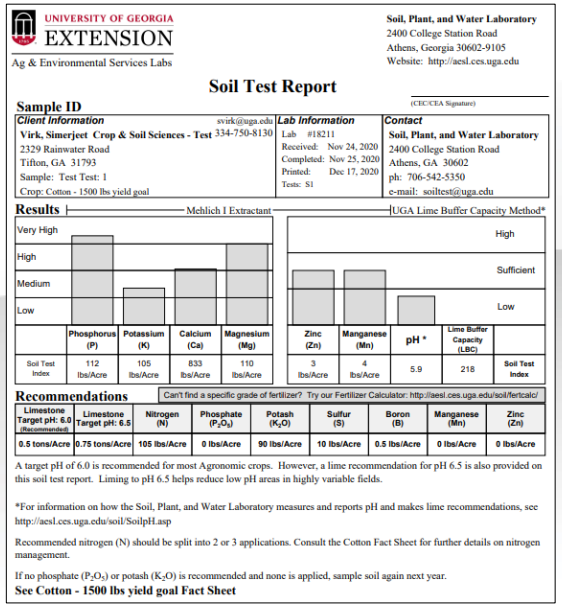
Mapping Soil Characteristics

- GPS coordinates and soil test results must be linked.



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Ag & Environmental Services Labs

Soil, Plant, and Water Laboratory
2400 College Station Road
Athens, Georgia 30602-9105
Website: http://aesl.ces.uga.edu

Soil Test Report

(CEC/CEA Signature)

Sample ID

Client Information	Lab Information	Contact
svirk@uga.edu Virk, Simerjeet Crop & Soil Sciences - Test 334-750-8130 2329 Rainwater Road Tifton, GA 31793 Sample: Test Test: 1 Crop: Cotton - 1500 lbs yield goal	Lab #18211 Received: Nov 24, 2020 Completed: Nov 25, 2020 Printed: Dec 17, 2020 Tests: S1	Soil, Plant, and Water Laboratory 2400 College Station Road Athens, GA 30602 ph: 706-542-5350 e-mail: soiltest@uga.edu

Results — Mehlich 1 Extractant — UGA Lime Buffer Capacity Method*

	Phosphorus (P)	Potassium (K)	Calcium (Ca)	Magnesium (Mg)	Zinc (Zn)	Manganese (Mn)	pH *	Lime Buffer Capacity (LBC)	
Soil Test Index	112 lbs/Acre	105 lbs/Acre	833 lbs/Acre	110 lbs/Acre	3 lbs/Acre	4 lbs/Acre	5.9	218	Soil Test Index

Recommendations — Can't find a specific grade of fertilizer? Try our Fertilizer Calculator: http://aesl.ces.uga.edu/soil/fertcalc/

Limestone Target pH: 6.0 (Recommended)	Limestone Target pH: 6.5	Nitrogen (N)	Phosphate (P_2O_5)	Potash (K_2O)	Sulfur (S)	Boron (B)	Manganese (Mn)	Zinc (Zn)
0.5 tons/Acre	0.75 tons/Acre	105 lbs/Acre	0 lbs/Acre	90 lbs/Acre	10 lbs/Acre	0.5 lbs/Acre	0 lbs/Acre	0 lbs/Acre

A target pH of 6.0 is recommended for most Agronomic crops. However, a lime recommendation for pH 6.5 is also provided on this soil test report. Liming to pH 6.5 helps reduce low pH areas in highly variable fields.

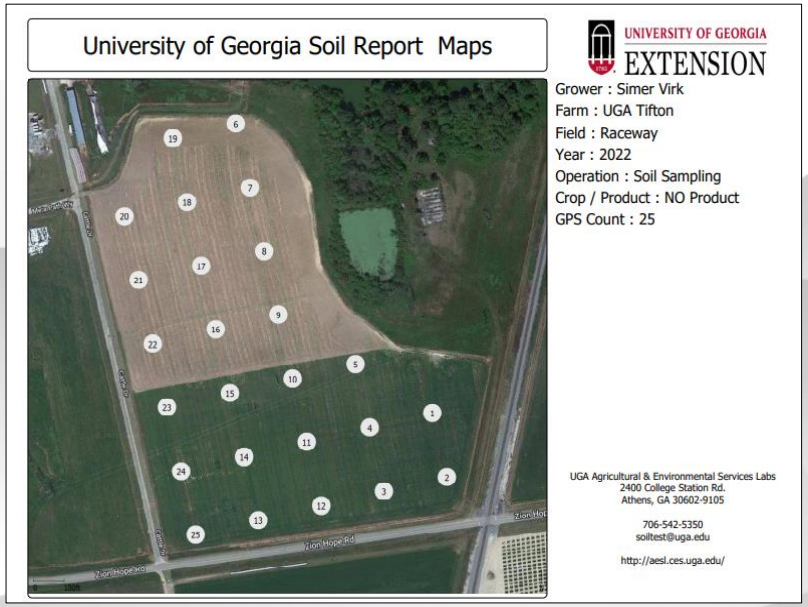
*For information on how the Soil, Plant, and Water Laboratory measures and reports pH and makes lime recommendations, see http://aesl.ces.uga.edu/soil/SoilpH.asp

Recommended nitrogen (N) should be split into 2 or 3 applications. Consult the Cotton Fact Sheet for further details on nitrogen management.

If no phosphate (P_2O_5) or potash (K_2O) is recommended and none is applied, sample soil again next year.

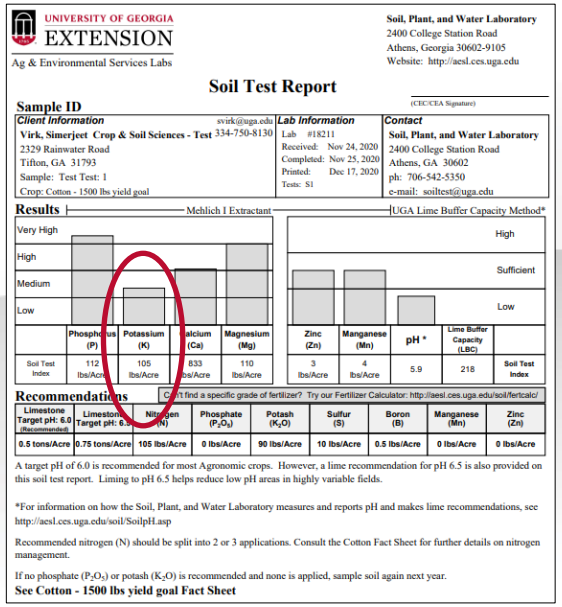
See Cotton - 1500 lbs yield goal Fact Sheet

+



Mapping Soil Characteristics

- GPS coordinates and soil test results must be linked.
- Use Ag GIS software to create maps representing the spatial variability in soil characteristics
- This process is called spatial interpolation, which uses statistics to estimate the values of unknown locations based on known values and locations.



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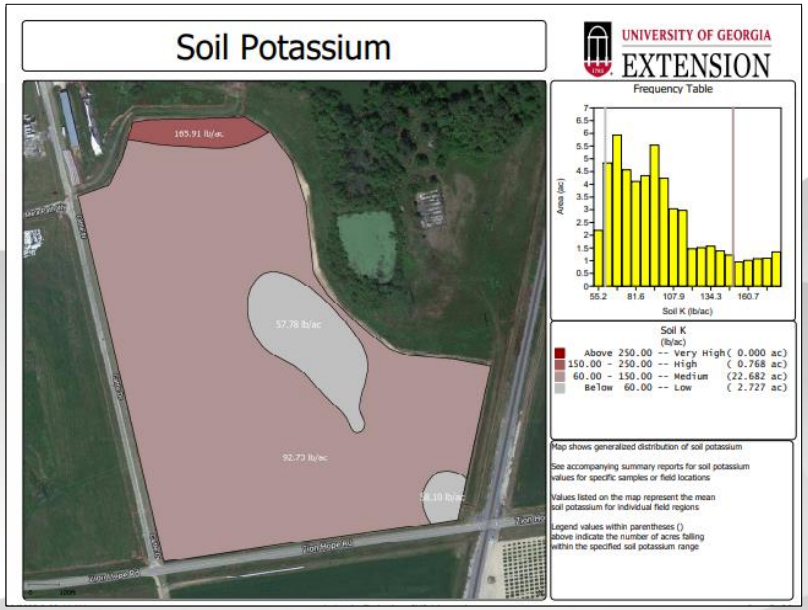
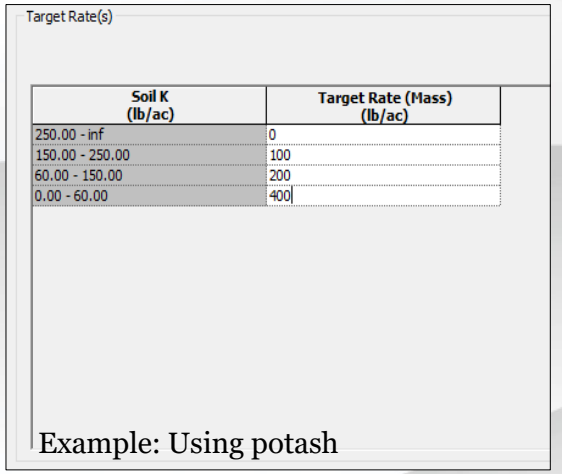


Generating Site-Specific Application Maps

- Use soil nutrient maps to develop fertilizer prescription maps.
- Areas with high soil nutrients are assigned low fertilizer rates.
- Areas with low soil nutrients are assigned high fertilizer rates

Soil K
(lbs./A)

Assign K Fertilizer Rates
(lbs./A)



K Prescription Map
(lbs./A)

File Transfer

- GIS software relies on shapefiles
  - Shapefiles contain ***<u>at least</u>*** 3 file types:
    - .shp - geometry data
    - .shx – index file
    - .dbf - attribute information
  - These files must be transferred together
- File transfer can be done wirelessly or using a flask drive

Making Variable-Rate Applications

- Tractor System Requirements:
  - GPS receiver
  - Display
  - Rate controller

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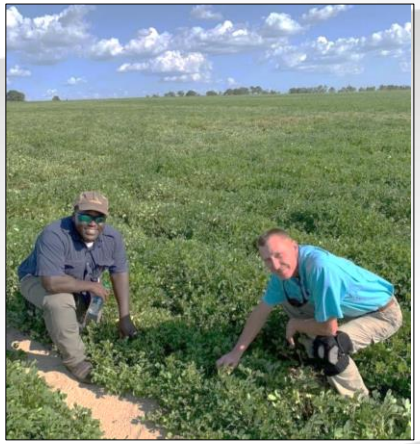
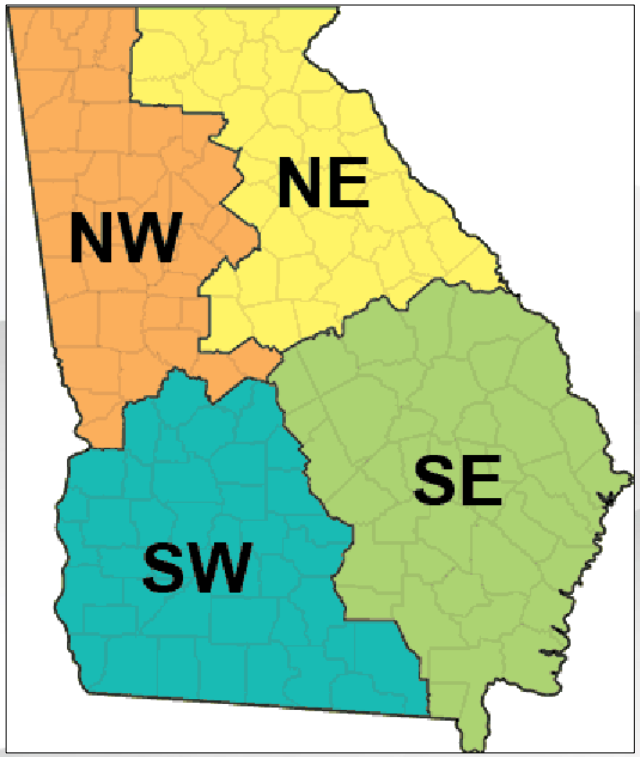
Resources within UGA Extension

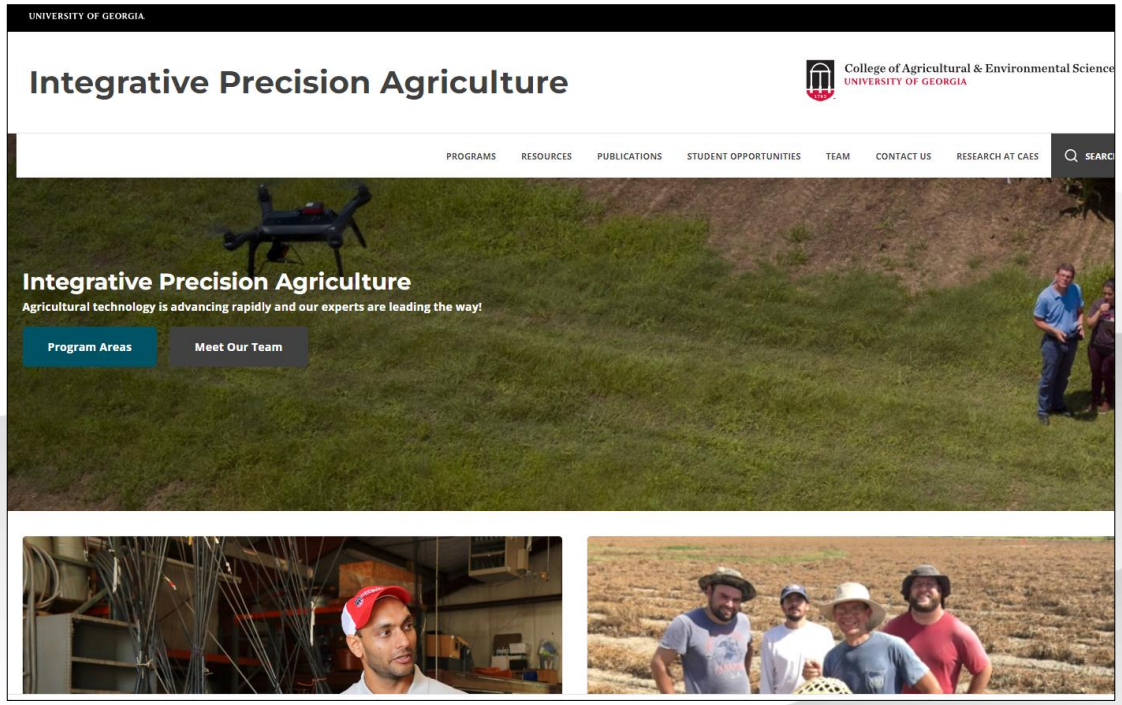
- Extension agents
  - Located in every county across the state
  - provide local support





Resources within UGA Extension

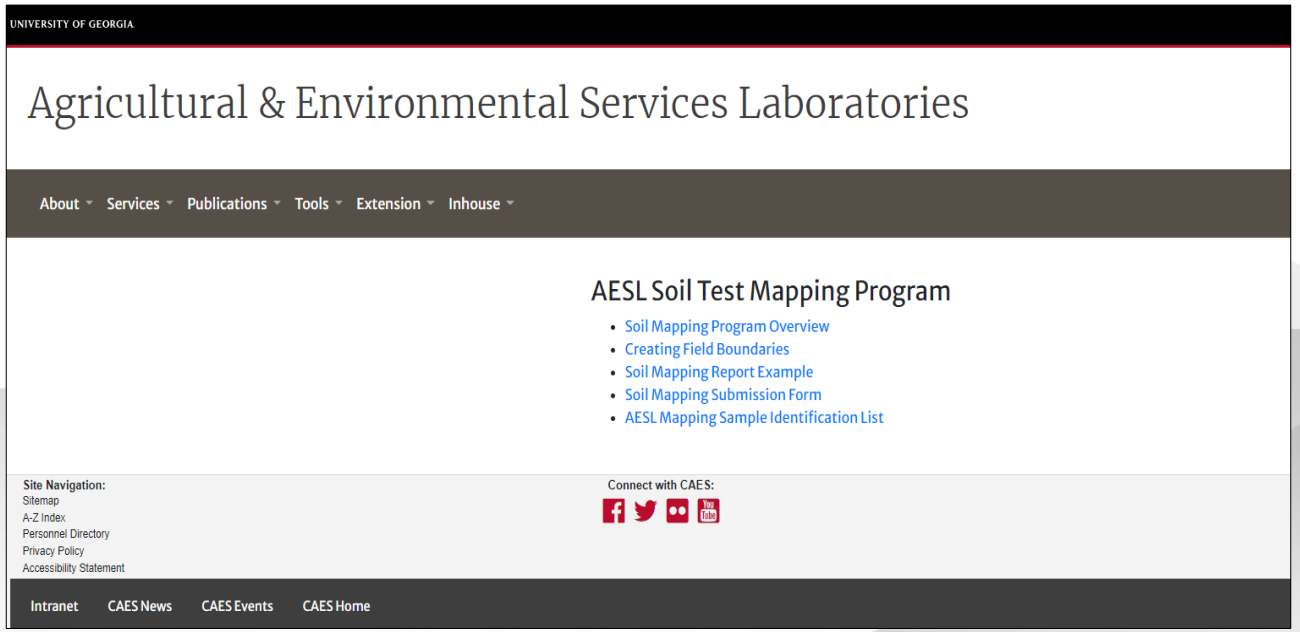
- Extension agents
- Integrative Precision Agriculture Team
  - Experts in latest research and technology



https://precisionag.caes.uga.edu/

Resources within UGA Extension

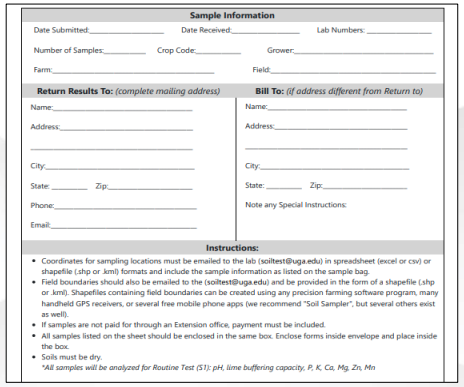
- Extension agents
- Integrative Precision Agriculture Team
- Agricultural & Environmental Services Labs (AESL)
  - Soil & plant tissue testing
  - New mapping service



Mapping Program: UGA Agricultural & Environmental Services Labs (AESL)

- Current Status:
  - New, pilot program
  - No charge at this time
  - Details may change

- Submission Requirements:
  - Submission form
  - Sample ID list
  - Field boundary (.shp or .kml)
  - Sampling locations (.shp or .kml)



Sample Information

Date Submitted:_____ Date Received:_____ Lab Numbers: _____

Number of Samples:_____ Crop Code:_____ Grower:_____

Farm:_____ Field:_____

Return Results To: *(complete mailing address)*

Name:_____

Address:_____

City:_____

State: _____ Zip:_____

Phone:_____

Email:_____

Bill To: *(if address different from Return to)*

Name:_____

Address:_____

City:_____

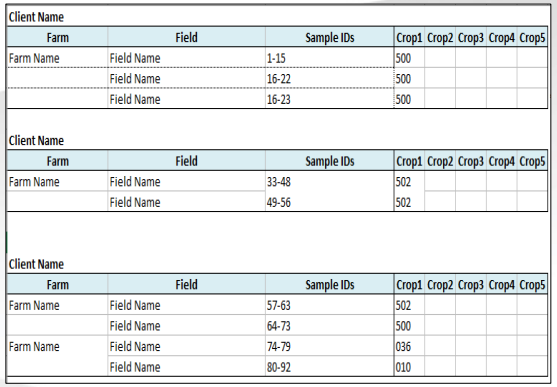
State: _____ Zip:_____

Note any Special Instructions:

Instructions:

- Coordinates for sampling locations must be emailed to the lab (soiltest@uga.edu) in spreadsheet (excel or csv) or shapefile (.shp or .kml) formats and include the sample information as listed on the sample bag.
- Field boundaries should also be emailed to the (soiltest@uga.edu) and be provided in the form of a shapefile (.shp or .kml). Shapefiles containing field boundaries can be created using any precision farming software program, many handheld GPS receivers, or several free mobile phone apps (we recommend "Soil Sampler", but several others exist as well).
- If samples are not paid for through an Extension office, payment must be included.
- All samples listed on the sheet should be enclosed in the same box. Enclose forms inside envelope and place inside the box.
- Soils must be dry.

**All samples will be analyzed for Routine Test (S1): pH, lime buffering capacity, P, K, Ca, Mg, Zn, Mn*



Client Name

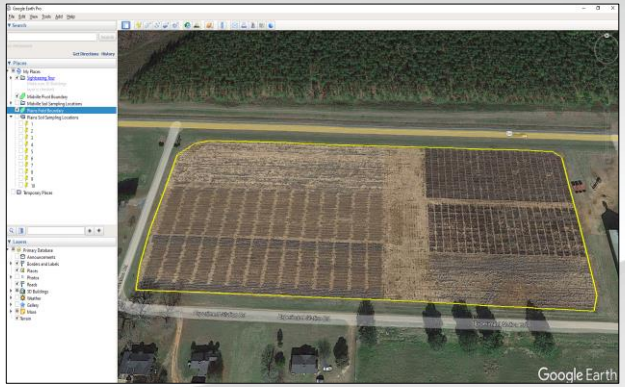
Farm	Field	Sample IDs	Crop1	Crop2	Crop3	Crop4	Crop5
Farm Name	Field Name	1-15	500				
	Field Name	16-22	500				
	Field Name	16-23	500				

Client Name

Farm	Field	Sample IDs	Crop1	Crop2	Crop3	Crop4	Crop5
Farm Name	Field Name	33-48	502				
	Field Name	49-56	502				

Client Name

Farm	Field	Sample IDs	Crop1	Crop2	Crop3	Crop4	Crop5
Farm Name	Field Name	57-63	502				
	Field Name	64-73	500				
Farm Name	Field Name	74-79	036				
	Field Name	80-92	010				



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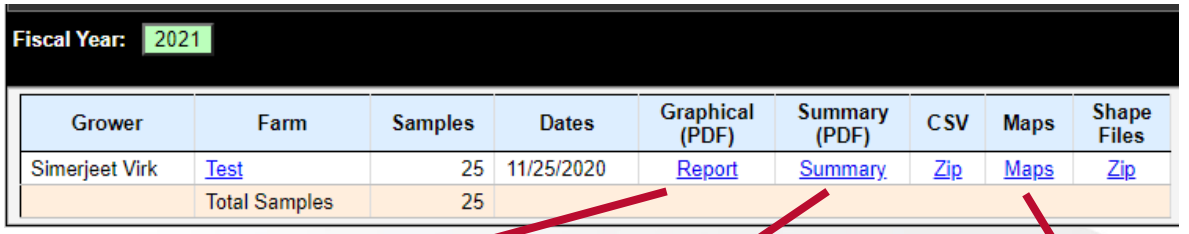
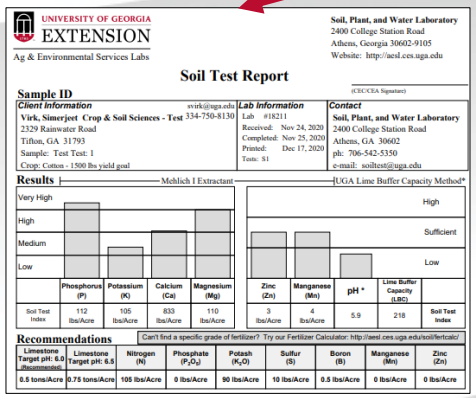
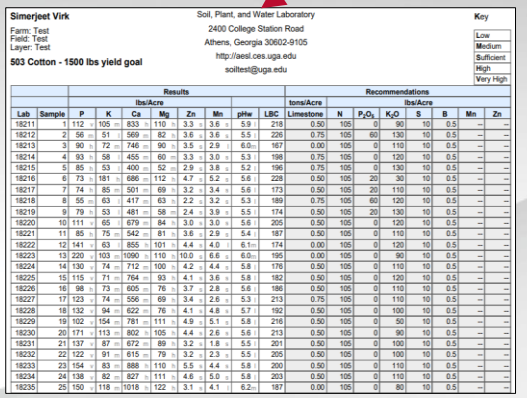
Mapping Program: UGA Agricultural & Environmental Services Labs (AESL)

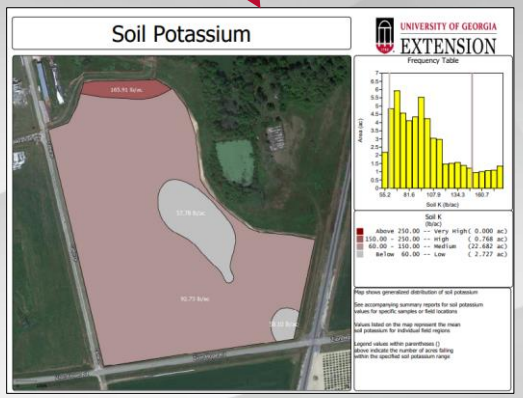
- Clients receive a unique link to access their results.

- Soil test results are reported in several formats.
  - Graphical
  - Summary spreadsheet
  - Maps









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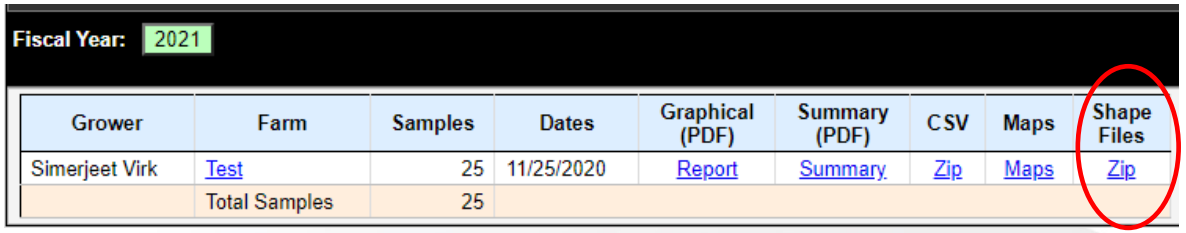
Mapping Program: UGA Agricultural & Environmental Services Labs (AESL)

- Soil test map shapefiles are also provided.

- Growers can work with their local consultant or fertilizer dealer to develop prescription maps based on the fertilizer availability in their area.



Fiscal Year: 2021

Grower	Farm	Samples	Dates	Graphical (PDF)	Summary (PDF)	CSV	Maps	Shape Files
Simerjeet Virk	Test	25	11/25/2020	Report	Summary	Zip	Maps	Zip
	Total Samples	25						