Minnesota Department of Agriculture
Pesticide & Fertilizer Management
QUARTERLY AND FINAL PROGRESS REPORTING
FOR THE PERIOD ENDING: JULY 31, 2021

PROJECT NUMBER: **MDA Contract (SWIFT) # 173687; PO# 300003522; SPA # 00083535; CON 000000084188**

PROJECT DESCRIPTION: Improving Soil Testing Services and Fertilizer Usage for Urban Communities

REPORT DUE DATE: On or before July 31, 2021

PRINCIPAL INVESTIGATOR: Dr. Carl Rosen

ORGANIZATION: University of MN - SPA
450 McNamara Alumni Center
200 Oak Street S.E.
Minneapolis, MN 55455

EMAIL: crosen@umn.edu

1.) **GOALS AND OBJECTIVES OBTAINED (*Specific to the work plan in the grant agreement, which goals or objectives have you accomplished. If possible, quantify progress made on each objective [example: we planted and maintained 10 of the 15 plots]. Include analysis, explanation, and specific reasons why goals and objectives were not met.*)**

-All currently-available fertilizer recommendations, rules, and comments have been loaded into the new database.
-The billing, client-report interface and web-based support tools have been developed.
-New reports are more specific to each sample, with pointed comments and less extraneous or generalized information than the old version (see new example reports, attached).
-A fertilizer calculator has been developed and will feature prominently on our Soil Test Interpretation web page. The calculator will allow people to plug in the values from their reports and obtain guidance for selecting the correct amount and fertilizer blend for their needs. Several options may be listed, and cost calculations will be included to help them make the best use of their fertilizer dollars.
-University OIT has signed off on the project as "substantially complete".
-Side-by-side validation/verification of "demo" reports is underway.
-Once validation is complete, we anticipate demonstrations to Extension Educators to familiarize them with the new product to commence later this summer. Projected release for the public is Spring 2022.

2.) **ACTIVITIES PERFORMED AND OUTCOMES (*Describe the types of activities that you performed and the resulting outcomes...may include maps, photographs, etc.*)**

-Test data for 1000+ requests have been entered into the new system to verify accuracy and performance.
-During validation, remaining issues are being dealt with on a case-by-case basis.
-Billing and accounting systems have been tested and are functional.
-New pricing mechanism is being built into the system to allow for future price adjustments.
See attachments for examples of what the new output will look like.

3.) **CHALLENGES ENCOUNTERED AND LESSONS LEARNED (*Describe any challenges that you encountered and what was learned from those challenges.*)**

-Demands for the time and effort of the CFANS OIT Team significantly delayed this project.
-COVID-19 caused this project to be moved down the list of priorities behind distance-education and contact-tracing efforts needed at the college level.
-CFANS OIT did not grasp the complexity of this project until too far along in the process. Initial goals and timelines were extremely optimistic.
-Pulling together all the supporting and background information for this database program was extremely time- and labor-intensive. Better and more complete records for this project are being coded directly into the system, should anyone have to add to it or make changes in the future.
-One of the benefits of this system will be expandability. If OIT staff are allowed to devote sufficient time and effort to this project, we should launch the Soil Testing Database AND add-on Floriculture Reporting Engine this fall.

4.) FINANCIAL INFORMATION (*This may include balance sheets or general ledger. The reports should be broken out by budget category as listed in the grant agreement and should show how much grant funding and how much match funding was spent. No more than 10% of the total award can moved from one budget category to another without prior approval. Provide analysis, explanations, and specific reasons why any cost overruns may have occurred. Attach sheets as necessary to provide this information.*)

Expense category	Amount awarded	Amount Spent as of June 30, 2021	Balance as of June 30, 2021
Salaries	$20000	$20000	0.00
Project total	$20000	$20000	0.00

University accountants adjusted the funding to pay for inhouse work. The original labor was earmarked for external consultants, but university OIT handled the development of this database and support tools. Staff salaries have consumed the allotted funds through billing of their hours to this project.

Examples of outputs for urban gardens and crops

UNIVERSITY OF MINNESOTA

Soil Testing Laboratory

SOIL TEST CLIENT
98765 432ND ST
AITKIN, MN 56431

SOIL TEST REPORT

Lawn and Garden

Client Copy

Department of Soil, Water, and Climate
Minnesota Extension Service
Agricultural Experiment Station

Report Number: 78009
Lab Number: 155672
County: Aitkin
Drop Off Date: 4/8/2021
Report Date: 7/8/2021

SOIL TEST RESULTS: GARDEN

Estimated Soil Texture	Organic Matter %	pH	Soluble Salts mS/cm		Nitrate NO3-N ppm		Bray Phosphorus ppm P	Potassium ppm K	Sulfur SO4 -S ppm	Zinc ppm	Iron ppm	Manganese ppm	Copper ppm	Boron ppm	Calcium ppm	Magnesium ppm	Lead ppm
C	6.9	6.9					100	166									

INTERPRETATION OF SOIL TEST RESULTS

Recommendations for: Vegetable Garden

Lime Recommendation	Nitrogen Recommendation	Phosphate Recommendation	Potash Recommendation
0 #ENP/A	0.15 Lbs / 100 SQ. FT.	0 Lbs / 100 SQ. FT.	0.1 Lbs / 100 SQ. FT.

The approximate ratio or proportion of these nutrients is: 25 - 0 - 15.

The soil nitrate test can be used to predict fertilizer N needs in your area if samples are taken before planting in the spring. If the sample was collected at another time, the N recommendation listed is based on organic matter content.

On coarse or sandy soils, the recommended rate of nutrients should be applied equally across regular split applications.

Use a fertilizer with the percentage of nutrients closest to the ratio shown above. Apply according to the directions on the container, or determine the amount using the fertilizer calculator linked on our website. Since meeting the exact amount of each nutrient may not be possible with available fertilizer blends, it may be most beneficial to apply the amount of nitrogen indicated and compromise on phosphate and/or potash.

UNIVERSITY OF MINNESOTA

Soil Testing Laboratory

SOILTEST CLIENT
PO BOX xxxx
BALSAM LAKE, MN 56678

SOIL TEST REPORT

Farm and Field

Client Copy

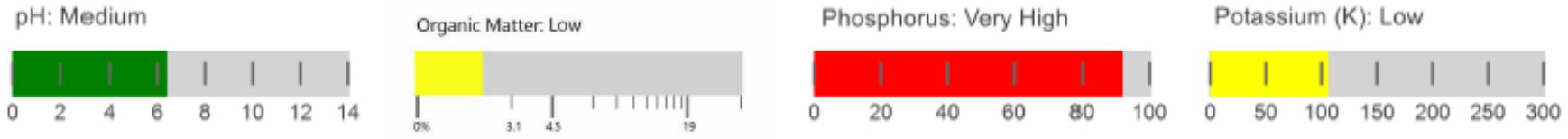
Department of Soil, Water, and Climate
Minnesota Extension Service
Agricultural Experiment Station

Report Number: 77675
Lab Number: 155090
County: Lake
Drop Off Date: 3/30/2021
Report Date: 7/13/2021

SOIL TEST RESULTS: ONION

Estimated Soil Texture	Organic Matter %	pH	Soluble Salts mS/cm		Nitrate NO3-N ppm		Bray Phosphorus ppm P	Potassium ppm K	Sulfur SO4 -S ppm	Zinc ppm	Iron ppm	Manganese ppm	Copper ppm	Boron ppm	Calcium ppm	Magnesium ppm	Lead ppm
C	2.0	6.4					92	106		0.7	73.8	1.0	1.7		668	95	

INTERPRETATION OF SOIL TEST RESULTS



Recommendation (1 of 3) for:

Onions, Dry

	Lime #ENP/A	N lb/A	P2O5 lb/A	K2O lb/A	S lb/A	Zn lb/A	Fe lb/A	Mn lb/A	Cu lb/A	B lb/A	Ca lb/A	Mg lb/A
Amount	2000	130	5	150		1		0	0.3*		0	0
Application Method	Broadcast	Broadcast	Broadcast	Broadcast		Broadcast		Broadcast	Broadcast		Broadcast	Broadcast

- IF SOIL TEXTURE IS COARSE: To avoid potential nitrate leaching losses on coarse textured soils, nitrogen should be applied in two or three split applications.
- The soil nitrate test can be used to predict fertilizer N needs in your area if samples are taken before planting in the spring. If the sample was collected at another time, the N recommendation listed is based on yield goal, previous crop, and organic matter content. See Bulletin 3790 B (revised) for more details.
- * Optional: Response to copper by vegetables and small fruits on mineral soils has not been observed in Minnesota. Research in other states has shown that 0.4 ppm is sufficient.
- Response to manganese on mineral soils by vegetables (except onions) and small fruits has not been observed n Minnesota, therefore, none is recommended.
- Soil test for Iron has not been calibrated for predicting Iron requirements in Minnesota, therefore, no recommendations are provided. If interveinal chlorosis is apparent, then a foliar application of Fe may be beneficial. For blueberries, soil pH should be lowered to 5.5 or less.
- Calcium level is low or medium, but calcium requirements are usually met by limiting the soil to a pH of 6.0 for mineral soils and 5.5 for organic soils. Additional soil-applied calcium, except that provided with lime, is not recommended. For physiological calcium disorders such as blossom end rot in tomatoes, tipburn in lettuce, black heart in celery, bitter pit in apples, foliar Ca sprays man be beneficial. Calcium chloride at the rate of 5-10 lb./acre or calcium nitrate at 10-15 lb./acre should be applied directly to sensitive tissue.
- Magnesium level is sufficient for all fruit and vegetable crops.
- Lime recommendations are reported as lb. of ENP (Effective Neutralizing Power) per acre. To determine the tons of lime needed to be applied per acre, divide the ENP recommendation by the "ENP PER TON" value provided by your liming material dealer.
- For best results, the recommended rate of lime should be broadcast and incorporated from 6 to 12 months before seeding.

UNIVERSITY OF MINNESOTA

Soil Testing Laboratory

SOILTEST CLIENT
PO BOX xxxx
RED LAKE, MN 56671

SOIL TEST REPORT

Farm and Field

Client Copy

Department of Soil, Water, and Climate
Minnesota Extension Service
Agricultural Experiment Station

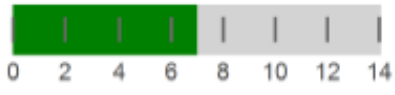
Report Number: 77537
Lab Number: 154890
County: Beltrami
Drop Off Date: 3/25/2021
Report Date: 7/13/2021

SOIL TEST RESULTS: Tomatoes

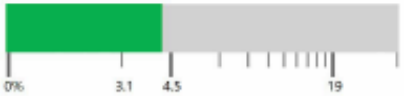
Estimated Soil Texture	Organic Matter %	pH	Soluble Salts mS/cm		Nitrate NO3-N ppm		Bray Phosphorus ppm P	Potassium ppm K	Sulfur SO4 -S ppm	Zinc ppm	Iron ppm	Manganese ppm	Copper ppm	Boron ppm	Calcium ppm	Magnesium ppm	Lead ppm
M	3.8	7.0					3	85							2283	724	

INTERPRETATION OF SOIL TEST RESULTS

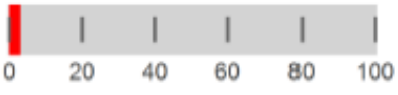
pH: Medium



Organic Matter: Medium



Phosphorus: Very Low



Potassium (K): Low

Recommendation (1 of 3) for:

Tomatoes

	Lime #ENP/A	N lb/A	P2O5 lb/A	K2O lb/A	S lb/A	Zn lb/A	Fe lb/A	Mn lb/A	Cu lb/A	B lb/A	Ca lb/A	Mg lb/A
Amount	0	110	250	150							0	0
Application Method	Broadcast	Broadcast	Broadcast	Broadcast							Broadcast	Broadcast

- Use of a starter solution high in phosphorus is recommended for transplants.
- Calcium level is high. Additional soil-applied calcium, except that provided with lime, is not recommended. For physiological calcium disorders such as blossom end rot in tomatoes, tipburn in lettuce, black heart in celery, bitter pit in apples, foliar Ca sprays man be beneficial. Calcium chloride at the rate of 5-10 lb./acre or calcium nitrate at 10-15 lb./acre should be applied directly to sensitive tissue.
- Magnesium level is sufficient for all fruit and vegetable crops.
- Manure applications result in nutrient credits that should be subtracted from fertilizer needs. Proper nutrient crediting is discussed in bulletins: AG-FO-5879C, 5880C, 5881C, 5882C, and 5883C available at your County Extension Office