NEW YORK ON-FARM RESEARCH PARTNERSHIP

PROJECT: POTASSIUM AND SULFUR FOR ALFALFA
STATUS OF 3RD AND 4TH YEAR ALFALFA FIELDS IN NEW YORK

2012 Protocol for Tissue, Soil and Yield Sampling at 3rd Cut

Overview

Soil can supply large amounts of potassium (K) but producers and agricultural advisors are reluctant to eliminate K use for large K consumers like alfalfa, fearing reduced yield and/or winter kill. In addition, sulfur (S) deposition rates have drastically decreased over the past 10 years and recent on-farm trials show a yield response to S addition, possibly due to the role S plays in N fixation by alfalfa. Both K and S are macronutrients essential for crop growth. Producers want to know: (1) whether S and K applied with manure in corn years is sufficient to bridge alfalfa years in rotations; and (2) what tools to use to reliably identify if extra S or K are needed. For K management, three approaches are commonly used: (1) K removal, (2) soil test K, and (3) K saturation-based methods. For S management, recent NY farm trials resulted in the calibration of a new soil test for S; tissue testing was effective in identifying S and micronutrient deficient sites as well. Recommendations for K for alfalfa can vary from 0 to 145 lbs K_2O, so side-by-side studies are needed to determine impact of K addition on crop yield, stand survivability, and forage quality. Recommendations for S are 20-30 lbs S/acre for S deficient sites. Now that we have a new Cornell sulfur test and validated calibrations for the Cornell Morgan soil test for K for alfalfa, in this new project in 2012/2013 we aim to evaluate 50 alfalfa fields (across the state; two fields per farm) for K and S status through both tissue testing and soil testing at 3rd cutting for two years (2012 and 2013 growing seasons). Farmers are invited to submit ***yield, tissue and soil data for two fields***, ideally one field for which a S or K deficiency might be expected, and one for which a deficiency in either macronutrient is unlikely.

Scope of work

- Identify a high fertility field and a S and K deficient field (selection criteria presented below).
- Just prior to 3rd cutting of the two selected fields, collect three types of samples from each field: (1) harvest samples to determine yield, (2) alfalfa tissue samples to be analyzed for nutrient content, and (3) soil samples to be analyzed for soil S ($CaCl_2$ analysis), soil test K, Ca and Mg (Morgan). Percent soil K, Ca, and Mg saturation will also be determined, based on the $SrCl_2$ extraction method.
- Fill out a brief, half page field information form for each of the two fields and submit along with the samples to the NMSP program.

Selecting the optimal or high fertility field:

Target well managed 3rd or 4th year alfalfa fields with a recent manure history, and/or that are optimum to high in organic matter. Comparison between this field and the deficient one could be 2 different soil types or 2 different manure histories (long history of manuring vs. no or little history of manure).

Selecting the deficient field:
For the fields with the greatest chance of a S deficiency, target well managed 3rd or 4th year alfalfa fields on light textured soils (SMG 3, 4 or 5), low in organic matter (the lower, the better, ideally <3%), and without any manure application since the seeding year.

Be sure the farm will give you at least a few days warning about the date 3rd cutting will take place.

Contact NMSP to give us a heads up and arrange the manner of sample storage, mailing or pick up:

Quirine Ketterings	Greg Godwin	Sheryl Swink
qmk2@cornell.edu	gsg6@cornell.edu	sns7@cornell.edu
607 229 0120	607 279 4627	607 255 2875

FIELD SAMPLING DAY
Equipment needed

- Camera for photos of sampled fields
- GPS for taking field site coordinates
- Sampling frame
- Grass clippers - battery operated is easiest, but hand operated will work
- 2+ large paper grocery bags per field for harvest samples, plus extras in case sample is very large or bag is torn/flawed (will need 1-2 bags per field sampled)
- scissors for cutting tissue samples
- wood board and knife
- 2+ paper lunch bags for tissue samples (1 bag per field for 6 inch alfalfa tips)
- Soil probe (1 or 2)
- Buckets or coffee cans for collecting composite soil samples (1-2)
- Plastic bags for soil samples (4 plus extras)
- 2 cardboard tags for labeling soil samples
- Sharpie or other impermeable pen for labeling bags and tags

I. Identification of sampling location within field

1. Select a somewhat homogenous 200 by 200 feet area within the field that is representative of the alfalfa stand in that field.

2. If possible, record location of the sampling site in the field using GPS (Global Positioning System) to record coordinates within the sampling area.

3. Take a couple photos of each field sampled - one overview representative of the field and sampling area and one close-up representative of the alfalfa mix and coverage within a sampling frame (looking down at the field cover).

4. Collect alfalfa harvest, tissue, and soil samples 1 to 2 days before the farmer harvests the fields, following the protocols listed below and in the order listed.

II. Alfalfa Harvest Sampling for Yield Calculations

- Sampling frame (38.5” long by 8” wide, with legs holding it 4” high)
- Grass clippers
- 2+ large paper grocery bags per field for harvest samples, plus extras in case sample is very large or bag is torn/flawed (will need 1-2 bags per field sampled)
- Permanent marking pen

1. Alfalfa harvest: Slide open end of sampling frame into grass at a slight angle, allowing the frame to part the grasses along length of frame. Manually clean up along frame edges so that alfalfa and grasses rooted inside the frame are standing inside the frame and alfalfa and grasses rooted outside are all outside the frame. Using the battery operated grass shears, grab handfuls of alfalfa mixture (including weeds and grasses) and harvest everything that is within the frame using the top of the frame as cutting height guide (4 inches above ground) and place cuttings in a paper grocery bag. Move frame and cut 2 more representative subsamples (frames) from the field and combine in the same bag. Fold over the top of the sample bag and write farm name, field ID number, and sampling date on bag before leaving the field. ***In total, each bag should contain the harvest of three 2-square feet areas***.
2. Bagged samples and data sheet go to NMSP at Cornell for processing and analysis.

III. Tissue Sampling

- Scissors (1 pair)
- Small (lunch-sized) paper bags for tissue quality samples (1 for each field sampled)
- Knife and cutting board with 6” marker for cutting tissue samples to length

1. Collect sample for tissue analysis: Hand collect a subsample of 30-35 alfalfa shoots at approximately six randomly selected sites in the sampling area (approximately 10-12 shoots from very near ***but not within*** each of the three harvested frame patches, cutting long (more than 6 inch) stems with the scissors.
   - When collecting the top ***6+ inches*** of ***35 alfalfa shoots*** (not the grass!) from the selected area,
     - Do not sample plants under obvious stresses, i.e. severe drought, insect, or disease problems.
     - Do not collect plants near field edges bordering gravel roads. The road dust could bias the results.
2. Align the tips of the stems, set on cutting board and, measuring 6 inches from the tips, slice across stems with knife and place just the 6-inch tips in small paper bag labeled with the farm or farmer’s name, field ID, and sampling date. Fold down top of bag to close.
   - Bagged samples go to NMSP at Cornell for processing and analysis.

IV. Soil sampling

- Clean buckets or coffee cans for collecting composite soil samples (1-2)
- Plastic bags for soil samples (4 plus extras)
- 2 cardboard tags for labeling soil samples, 1/field

For each field:

1. Take one composited soil sample consisting of 10 individual cores per field (0-8 inches, randomly selected within the harvested frame areas after cutting harvest sample). It is very important to consistently take 0-8 inch depth samples. Use bucket to collect and mix soil (see photo).
2. Place composite soil sample in plastic bag, seal, and enclose in 2nd plastic bag along with a label filled out with the farm's name, farm's field ID, and date sampled. (Label goes in the 2nd bag, not the bag of soil, to keep it dry.)
    - Collect bags from each field and freeze until samples can be transported to NMSP in Morrison Hall for processing and analysis.

V. Field Information Form

Data are only useful if accompanied by accurate field history information. Fill out an **Alfalfa K and S Study Field Information Form** for each of the two fields sampled for the study and submit along with the samples. ***Samples can only be accepted and analyzed as part of this study if they are accompanied by a fully completed field information form.***

Alfalfa K and S Study Field Information Form

Date:

Field background	**Field #1**		**Farmer Field ID:**			
Collaborator name and email						
Producer name						
Field location (town, county)						
Soil type						
Artificial drainage?						
Crop rotation	2009:	2010:	2011:	2012:	2013:	2014:
Date of first cut (farmer) 2012	if available:					
Manure history						
Last manure application (year and rate)						
Number of manure applications in last 5 years						
Field composition (2011)						
Estimated percentage alfalfa						
Grass species						
Alfalfa variety						

Notes:

Alfalfa K and S Study Field Information Form

Date:

Field background	**Field #2**		**Farmer Field ID:**			
Collaborator name and email						
Producer name						
Field location (town, county)						
Soil type						
Artificial drainage?						
Crop rotation	2009:	2010:	2011:	2012:	2013:	2014:
Date of first cut (farmer) 2012	if available:					
Manure history						
Last manure application (year and rate)						
Number of manure applications in last 5 years						
Field composition (2011)						
Estimated percentage alfalfa						
Grass species						
Alfalfa variety						

Notes:

Alfalfa K and S Study Site Map 2012

Field 1 (Farmer's Field ID:_____)
Date: _____Collaborator:_____ Farm name:_____

Location:_____
_____
_____
_____
_____
_____

GPS location (center of double plot)		
Rep	Latitude	Longitude
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____

Alfalfa K and S Study Site Map 2012

Field 2 (Farmer's Field ID:_____)
Date: _____Collaborator:_____ Farm name:_____

Location:_____
_____
_____
_____
_____
_____

GPS location (center of double plot)		
Rep	Latitude	Longitude
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____