

**FARMER
LEAD
RESEARCH**

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Black Avon Farm

The Farm

Tony and Erica Versteeg are a progressive young couple who recently purchased Black Avon Farm near Heatherton in Antigonish county. Although the couple maybe relatively new to Antigonish county, they are certainly not new to agriculture. Both grew up on farms and met at the Agricultural College where Erica was attaining a degree in Agricultural Business and Tony in

Farm Mechanization. After graduation, Erica began working as an Environmental Farm Planning Coordinator and Tony worked as a production supervisor at a producer-owned dairy as well as being employed on a number of dairy farms within the province.

With their combined experience and ambition they set their sights on one

day owning a dairy farm. In 2010, they purchased Black Avon Farms where they currently reside with their young family.

Black Avon Farm is a 104 ha dairy operation milking approximately 70 lactating cows. The farm is primarily forage based. The farm consists of a mosaic of soil series including Merigomish (sandy loam), Woodbourne (gravely loam to sandy loam), Queens (clay loam), Stewiacke (silt loam) and some edges of fields line the Herbert (sandy loam) series. These soils present a full spectrum in drainage capability of each field.



Tony and Erica Versteeg of Black Avon Farm with their best farm hands.

Where are the soil nutrients after fall incorporated manure?

The Question

Conventional soil testing relies on an approach designed to determine a single rate of nutrient application ignoring variability within the field. While precision agriculture has attempted to circumvent this by addressing the variability of soil nutrients on the surface, variability with soil depth is often ignored. Soil nutrients from surface applied manure can be inverted by plowing. Plowing has been shown to reduce soil nutrient content near the surface and to redistribute nutrients within the top 15 cm of soil. Recommendations to add a spring starter fertilizer

to fall plowed fields despite soil tests showing adequate soil nutrients are often recommended because the assumption is that the majority of the nutrients have been buried and are below the root zone of newly seeded crops. Conventional soil testing at Black Avon Farm indicated that soil nutrients were high, indicating there would not be an economic return to spring fertilizer application. However, this rating was an average of the top 15 cm of soil. The objective of this experiment was to determine whether there were differences in soil nutrients, with depth, after fall applied manure which was fall incorporated by plowing in a high fertility field.

How the question was approached



A soil core 25 cm long was collected and divided into five different depths

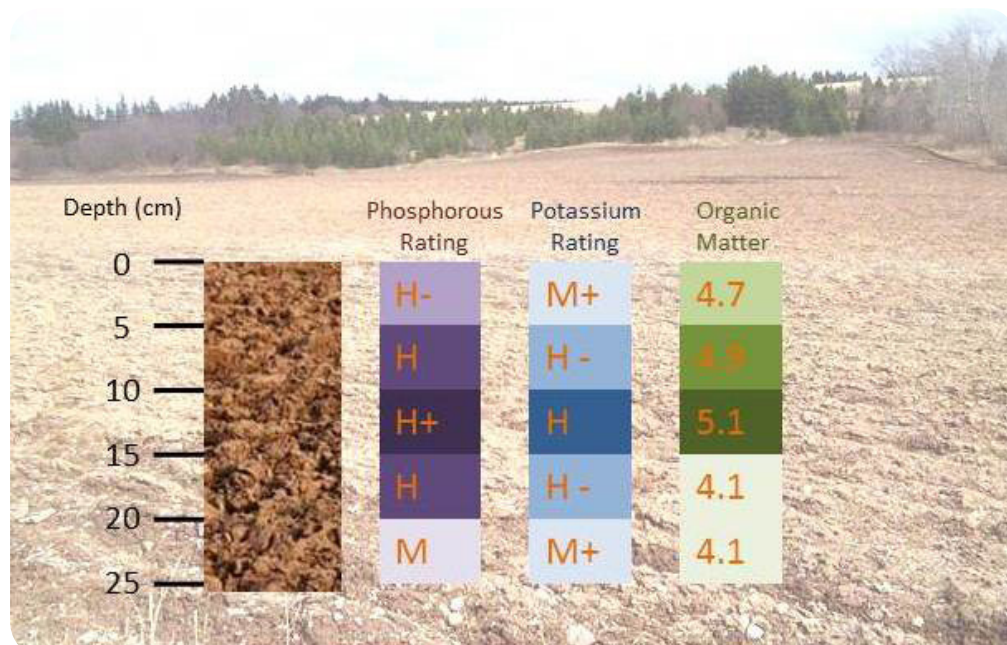
The site was a 3.2 ha field in that was to be seeded to a 40 % timothy, 60 % alfalfa mix. The soil is a Woodbourne type soil; a gravelly loam to sandy loam over gravelly clay loam soil. A composite soil sample was taken randomly across the field to a depth of 15 cm before manure was spread in the fall. A subsample was sent to the Nova Scotia Department of Agriculture analytical lab for analysis. The soil test determined that the pH was 6.8, phosphorous was rated high at 298 kg/ha and potassium was also rated high at 320 kg/ha. The field was previously in unimproved grass for a number of years. Manure was spread in the fall of 2011 at a rate of 30 tonne /ha and was incorporated by moldboard plow. The following spring, before planting and before additional fertility amendments were added, the field was resampled at depths of 0-5 cm, 5-10 cm, 10-15 cm, 15-20 cm and 20-25 cm. For each depth, 30 sub samples were taken across the field in a random pattern. The samples were compiled for each depth, mixed well and then a sub sample was taken from the composite and sent for analysis.

"Realistic questions, practical solutions - that's what farmer lead research is all about."
- Amy Sangster



Soil sampling in the field for the five depths took about 1.5 hours

Observations and Measurements



Soil testing to 15 cm last fall before manure application indicated that plant available nutrients levels were 298 kg/ha for P_2O_5 (phosphorous rated as H) and 320 kg/ha for K_2O (potassium rated as H) and the soil pH was 6.5. Both of these levels rated

as high (H). Organic matter levels were 4.9 %. Based on the results of the samples taken at 5 cm increments in the spring, after manure application and plowing, there did appear to be an inversion effect of nutrients. The highest levels of nutrients were

found between 10-15 cm. Nutrients were rated "high" at the 15-20 cm depth and the levels at this depth were higher than at the soil surface. The lowest nutrient levels were found at the 20-25 cm depth.

What does it all mean?

Ideally, adequate nutrients should be within the root zone of the developing plant. The majority of root concentration lies within the first 5 cm of soil. Because of the nutrient inversion effect, Black Avon Farms followed their fall applied manure with a top up application of manure which was applied in the spring before planting. This would place nutrients in the first 5 cm of soil

and ensure there were adequate nutrients for the growing seedlings. Timothy roots tend to be relatively shallow with 80% of the roots in the top 5 cm but mature stands of alfalfa have been reported to have tap roots extending 9 meters or more, so nutrients at depth can be utilized as the plant develops. In fact, the buried nutrients may provide potassium to the alfalfa that would

be accessed by the plants later in the season when roots are more developed. Potassium is important for winter hardiness. Although soil nutrient levels at Black Avon Farm were rated as high, it is important to reapply nutrients to maintain good levels. Every time a crop is removed, significant nutrients are also removed from that field.



Variability in a field also occurs with depth

The quick and 'dirty' answer to Black Avon's question:

The highest levels of nutrients were found at a depth of 10-15 cm.

What did it cost?

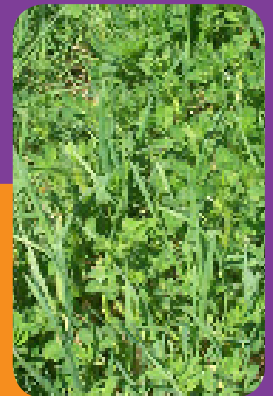
Soil samples cost registered farms \$12.35 per sample (\$24.70 for non registered farms). Since only one sub sample was sent for each depth and samples were taken at 5 different depths the total lab cost for this experiment was only \$61.75. The time taken to do the sampling was approximately 1.5 hours with another 0.5 hours to look at the reports and determine what they meant. If the hourly rate for the sampling was estimated as \$12/hr and if the farm managers time was estimated at \$25/hr to review the report, then the total cost of the experiment including time was \$ 92.25.

It is difficult to put a dollar value on the value of the information gained. If nutrient values were adjusted according to the results fertilizer cost could actually increase initially. However, ensuring that there are proper levels of nutrients for the germinating seedling within that first 5 cm of soil should translate into a stronger establishment, a healthier plant, and theoretically that should translate into greater yields and a better plant quality.

Discussion

Manure application to alfalfa is always met with some debate because it may over supply nitrogen which discourages the alfalfa plant from fixing its own nitrogen from the atmosphere (free fertilizer). However, alfalfa has a heavy requirement for phosphorous and potassium and has been shown to respond favorably to well-timed manure applications. Applying manure before seeding rather than after the stand is established, prevents mechanical damage to the alfalfa crowns which can reduce the persistence of alfalfa in mixed stands.

How much manure to apply will depend on the existing soil fertility and the demands of the crop. A 8 t/ha dry matter yield of a 70:30 alfalfa:timothy mix can remove approximately 121 kgs/ha of P_2O_5 (phosphorous), 661 kgs/ha of K_2O (potassium) and 94 kgs/ha of nitrogen (assuming alfalfa is fixing most of its nitrogen).



Timing, rate and source of nutrients can have a significant effect on the health of a crop

About Perennia

Perennia is a fully integrated agri-food and bio-resource company with integrated teams in extension and advisory services, quality and food safety, bioventures, and facilities. Specialists work with producers and processors to address production issues on farms, create internationally recognized quality and food safety programs, provide leased incubation space for new product development, and conduct research to transform underutilized land- and marine-based resources into high-value products.

Perennia combines the resources of AgraPoint, the Atlantic BioVenture Centre and AgriTECH Park.

Benefits of On-farm Research

Why do we stop asking why? Even a toddler can recognize that, “because I said so” is not necessarily the best answer to the question. On-farm research is quite simply about asking questions and finding good answers that are meaningful to **your** farm. It’s about real questions in real life situations. It’s a process. It’s a process that has benefits beyond just the findings. Conducting your own on farm research project will sharpen your observational skills, better enable you to assess the applicability of advice, allow you to get to know your farm even better, and help you make more confident decisions about changes on your farm.

Where do we come in? At Perennia, we can:

- help you design the process to ensure your questions can be answered in a practical, meaningful, and cost effective manner
- provide background information and relay findings to similar questions that have been asked
- serve as a resource throughout the project
- help compile the information collected, and produce a straightforward report that you and your neighbours can refer to
- help organize and host a workshop to share your findings

Research shouldn’t be restricted to the lab or to small field plots. Everyone can ask the question “Why”.



Your question,
your answers, and
a little bit of our
help

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