



Conventional and Novel Fertility Recommendations for Pasture

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Background:

Proper fertility nutrition is required for productive pastures and forages. This study was proposed to assess conventional soil test based fertility practices and a novel approach with a Pedogenesis Inc. soil report based on the Albrecht soil balancing approach.

The Pedogenesis approach had two goals, the first being to meet the fertility requirements while balancing calcium and magnesium cations. The second goal is proposed to build soil health through the addition of slow acting amendments in their custom blends including multiple compost products and humates. The Albrecht approach was touted to increase the yield of a more nutrient dense forage with improved ROI (return on investment).

Method:

Soil sampling was conducted near Brandon at the SW corner of the Manitoba Beef and Forage Initiative's (MBFI) Pasture A. (Figures 1-2). A description of the soil and its productivity is shown.

Soil tests were taken to produce fertilizer recommendations using the 2 systems. Both fertilizer treatments were broadcast in October 2019 (Figure 3) There were 3 treatments: 2 fertilizer treatments and a unfertilized control, and were replicated 3 times.

Cattle were excluded from small sampling areas for forage yield and quality assessments (Figure 4). Soil samples were taken in November 2020.

Forage production is very dependent upon rainfall, especially on such drought prone soil. Seasonal rainfall (April 1– Sept 30) in 2020 was 364 mm or 106% of normal.



Figures 1-2. Soil map at study site and a typical Stockton sand soil profile, From AgriMaps and Photo credits to MARD Soil Survey Group

Stockton Series (SCK)

The Stockton series is an Orthic Black Chernozem soil developed on moderately well to well drained, weakly to moderately calcareous, sandy (FS, LFS, LS), lacustrine sediments. These soils occur in the Upper Assiniboine Delta, the Brandon Lakes Plain and a few areas within the Lower Assiniboine Delta on very gently sloping to irregular undulating topography in association with Cactus, Lavenham, Hummerston and Sewell soils. Surface runoff is moderate, and permeability is rapid. Wind erosion is common if the soil is not protected with adequate surface residue.

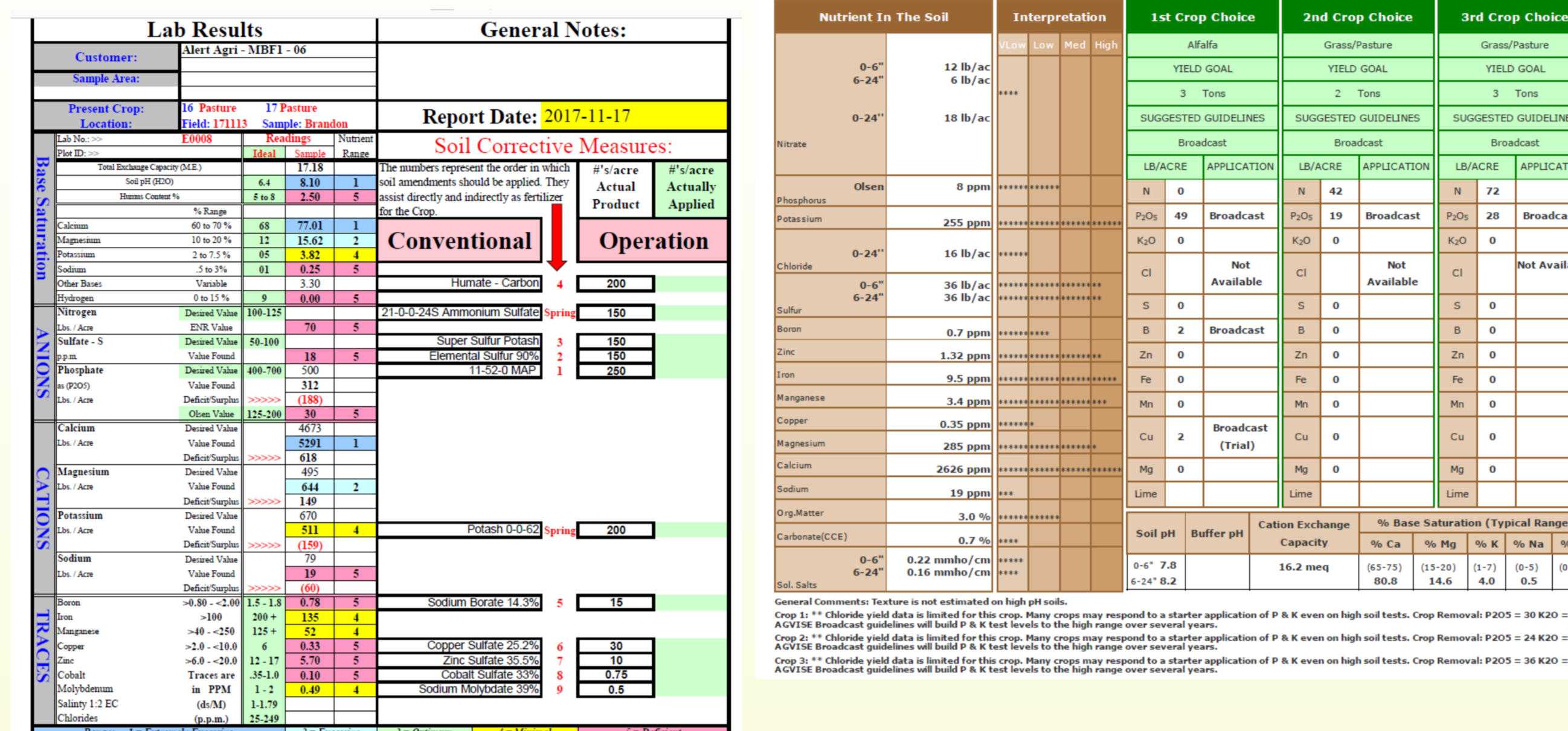


Figures 3-4. Pedogenesis fertilizer application (left) and forage production prior to harvest (right)

Results:

Soil analysis results (Figures 3-4)

Analytical values were very similar for pH, cation exchange capacity (CEC), OM (or humus), and once standardized to ppm or lb/ac for phosphorus (P), potassium (K), sulphur (S), calcium (Ca), magnesium (Mg), boron (B), and copper (Cu). Large differences were observed between iron (Fe), manganese (Mn) and zinc (Zn), presumably due to a different extraction process. Nutrient interpretation ranges differed greatly. AgVise ranked K, Zn, Fe, Mn as HIGH whereas Pedogenesis ranked them MINIMAL or DEFICIENT. Both labs ranked nitrogen (N), P, B, Cu as low or deficient and Ca and Mg as high or excessive.

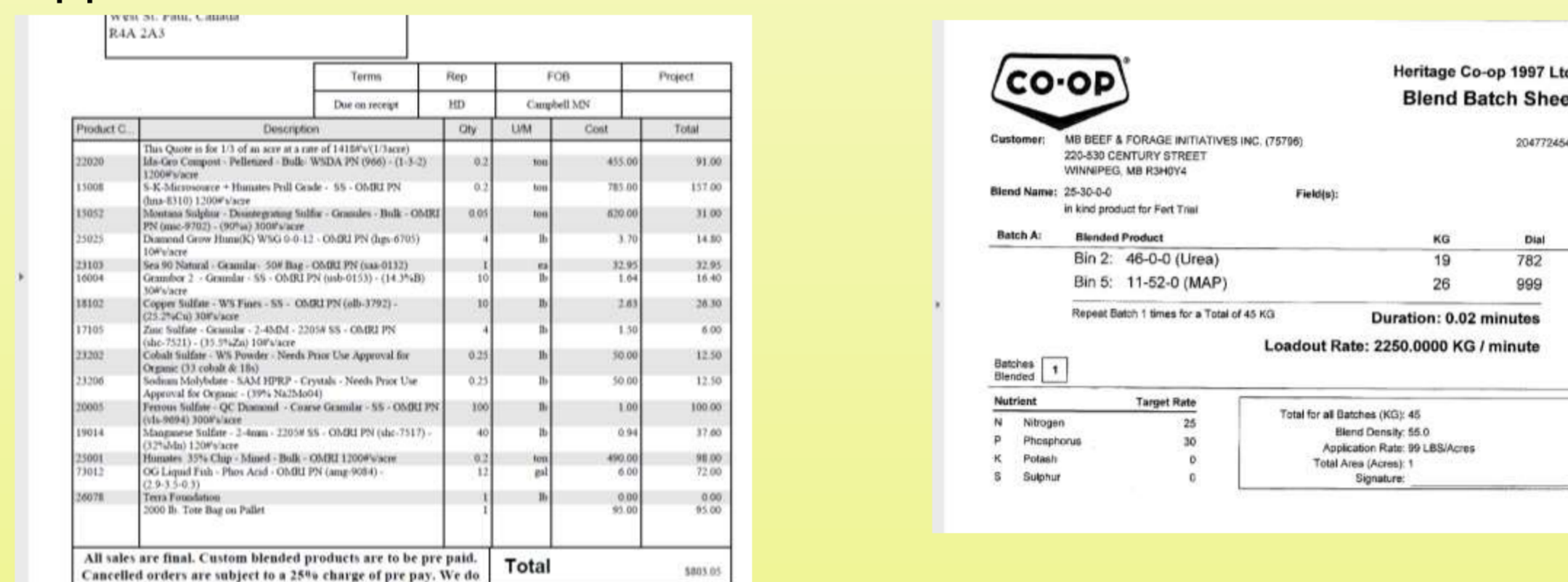


Figures 3-4. Soil analyses. Pedogenesis (left), Agvise (right).

Fertilizer recommendations (Figures 5-6)

Recommendations differed substantially in amount and cost.

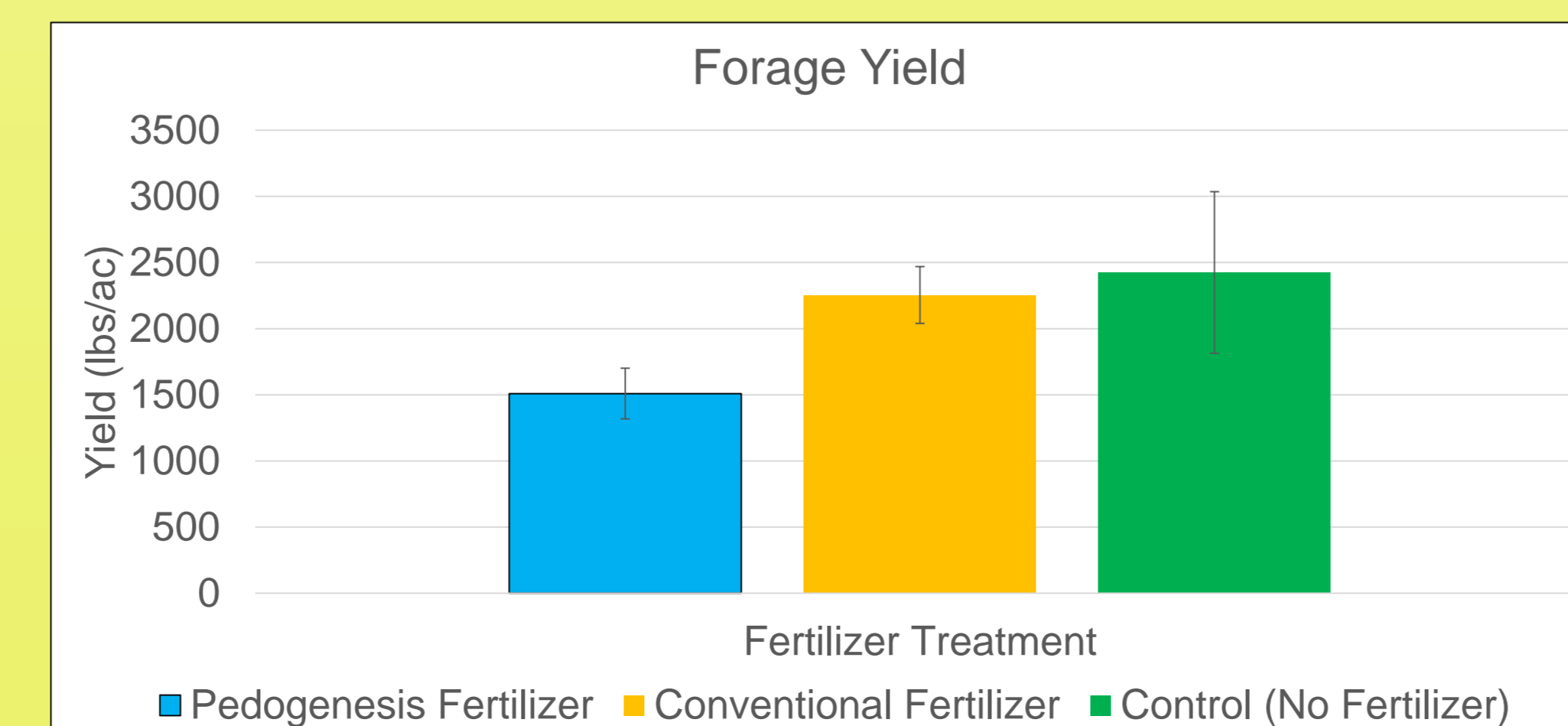
- As best as could be determined from Figure 5, the Pedogenesis fertilizer blend supplied the following lb nutrients per acre: 12 N, 36 P₂O₅, 34 K₂O, 378 S, 12 Ca, 4.3 B, 3.6 Zn, 84 Fe, 38 Mn, 7.6 Cu, 0.3 Mo, 0.25 Co, at a cost of \$2,409/ac. It is presumed that this single application is for multiple years.
- The conventional grass hay/pasture fertilizer recommendation was formulated using MB Soil Fertility Guide Appendix Table 16 (DRY moisture category = sandy loam soil receiving good rainfall with expected yield of 1.1 t/ac) and Table 7 for phosphorus, called for 32-20-0. An actual application of 25 lb N and 30 lb P₂O₅/ac was applied at a cost of \$25.15/ac. This should be an annual application.



Figures 5-6. Fertilizer amounts from Pedogenesis (left) and conventional (right) fertilization recommendations.

Yield Figure 5.

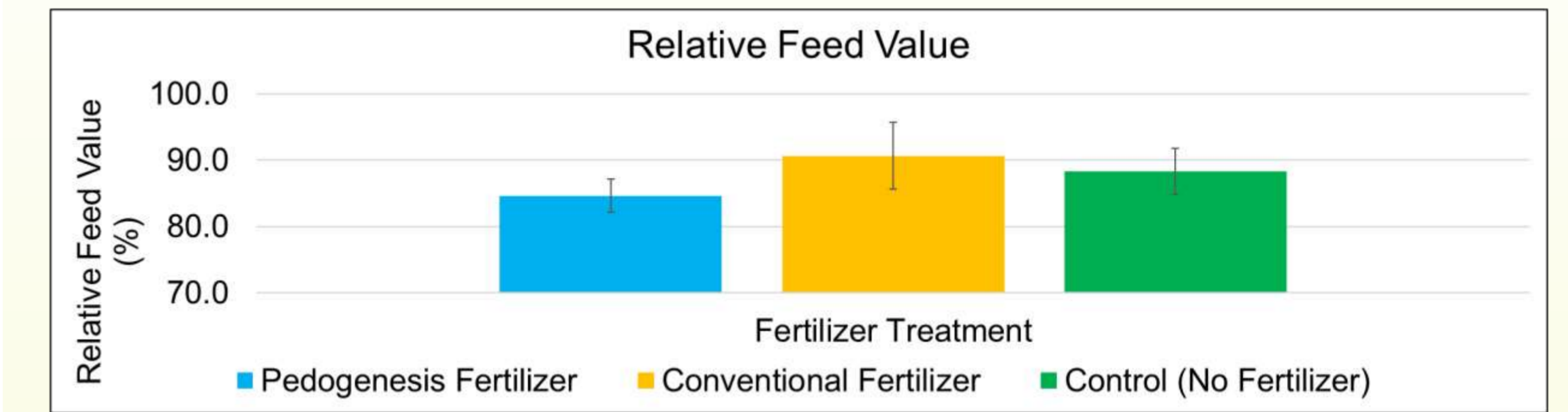
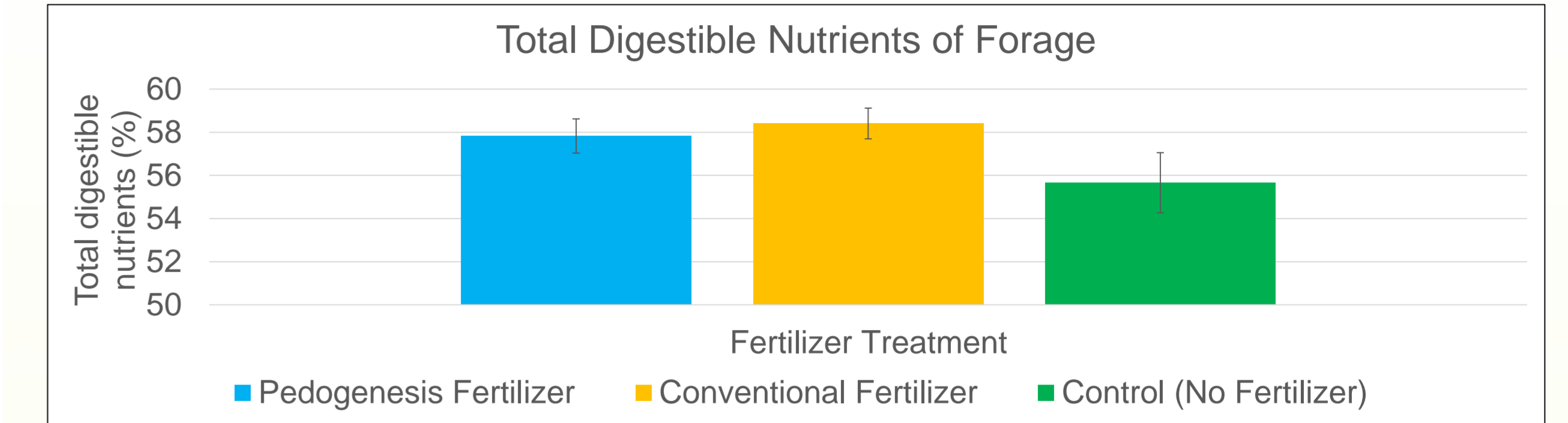
The yield of the control plot was highest but similar to the conventional fertilizer and markedly greater than the Pedogenesis fertilizer. Yields of the conventional fertilizer and control were similar to that expected from fertilizing to the DRY moisture category (1.1 t/ac = 2,200 lb/ac)



Figures 5. Forage yield. Average and standard deviation.

Forage quality (Figures 6-7)

Forage quality did not appear to be influenced greatly by fertility, although TDN was numerically least without fertilizer and RFV was numerically least with the Pedogenesis treatment.



Figures 6-7. Forage quality. Average and standard deviation.

Nutrient density

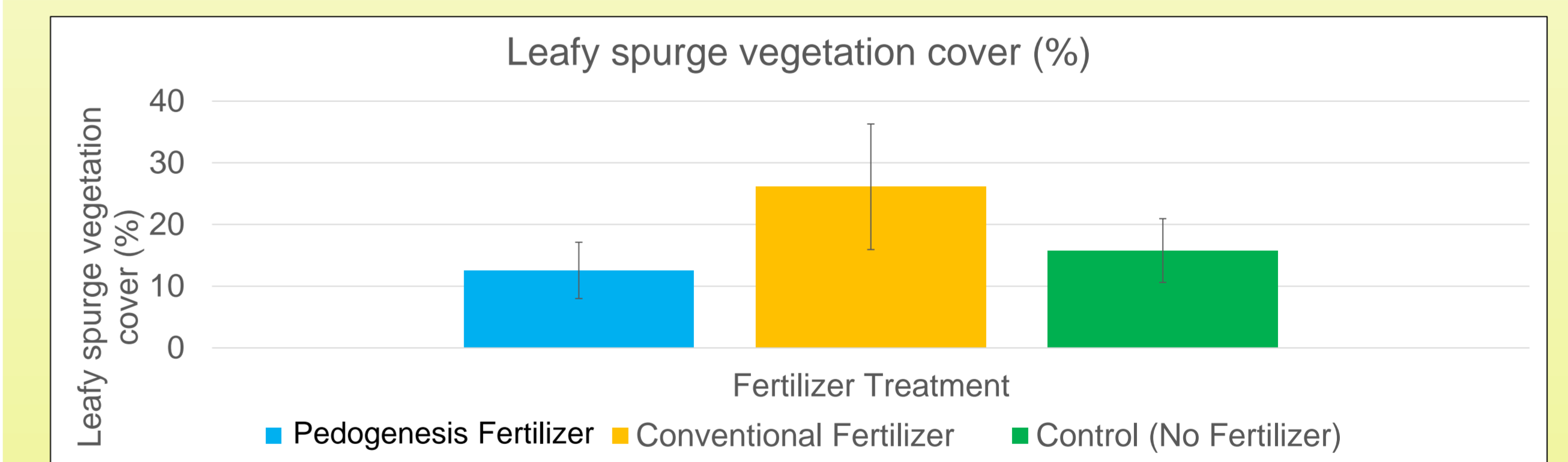
Nutrient density was not highest with the Pedogenesis treatment in spite of the lower yield. Most nutrients were numerically greatest with the conventional fertility treatment (protein, Ca, P, K).

Soil – residual fall 2020

The most marked changes in soil properties were an increase in Mg, S, Cl, Mn and Na under the Pedogenesis program. Soil pH and OM were similar to the control. The high rates of elemental S may impact soil pH given time.

Other observations (Figure 8)

Visual estimates of leafy spurge populations were numerically greater in the conventional treatment.



Figures 8. Leafy spurge cover. Average and standard deviation.

Summary:

Year 1 results : The Return on Investment (ROI) would be quite negative for the Pedogenesis treatment owing to the extremely high nutrient cost and reduction in yield without advantage in forage quality or nutrient density.

Based on the limited productivity of such droughty soil, it is unlikely that such costly fertilizer treatments will be profitable.

It is doubtful this short term view captured the expected long-term impact of the Pedogenesis treatment. Sampling of yields and soil properties should resume and continue in 2022.

Acknowledgements:

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