

Agriculture Research and Development

Improving Livestock Feed with Crop Rotations: Soybean Silage Evaluation Trial

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Project Objectives

- Evaluate soybean varieties used as silage in Newfoundland and Labrador;
- Evaluate the nutritional quality of soybean silage;
- Determine the effects of varied row spacing on soybean yield and nutritional quality when cut for silage;
- Observe the yield of crops following soybean cultivation and measure any reduction in fertilizer requirements following a soybean crop; and
- Increase the amount of no-till forage planting by using soybeans in a livestock feed rotation and determine optimum conditions for no-till planting of soybeans in Newfoundland and Labrador.

There is a demand from the livestock industry to produce high-quality silage and eliminate the need to purchase expensive imported feeds. Soybean as silage is a promising novel crop to Newfoundland and Labrador that is an excellent feed source and can increase soil fertility, improve weed control, improve soil health and increase yields of subsequent crops.

As a high-value annual, soybean can be incorporated into current rotations of silage corn, grain, canola or other annuals such as vegetables (i.e. rutabaga, cabbage, potatoes) already

under cultivation in the province. Soybeans are no-till seeded, which reduces erosion potential, and do not require ploughing that may bring rocks to the surface.

Additionally, soybeans are herbicide tolerant, allowing increased weed control throughout the season if weed thresholds are surpassed. The crop uses bacteria to assist in nitrogen production, reducing fertilizer inputs. Old plants left in the field following harvest are a source of slow-release nitrogen for following years. The feed value of soybean silage has been exceptionally high and dairy farmers have reported higher milk production.

The objective of this research is to evaluate the suitability of soybean as a silage crop for Newfoundland and Labrador. Large plot trials are being conducted on farms in the province to determine varieties with high yields and nutritional contents and to assess beneficial management practices.

Background

Crop rotations are a staple in sustainable farm management practices. Soybean as silage is a good candidate for a rotation in Newfoundland and Labrador.

- Soybean works with a bacteria called rhizobia that can make nitrogen available to plants from the atmosphere via a process called nitrogen fixation, eliminating the need for synthetic N fertilizers.
- Soybean is an annual crop, meaning it can only persist for one year.



- Soybean can be used in a two-year corn-soybean rotation and is an excellent candidate as a rotation for crops including cereal grains and canola.
- Cereals and corn require high quantities of nitrogen. Soybeans could potentially lower future fertilizer requirements, leaving a 'nitrogen credit'.
- Soybean can be no-till seeded, decreasing required time for field preparation.
- Use of rhizobia and no-till systems reduce associated greenhouse gas emissions and improve soil physical and chemical structure and the general health of the soil.

Technical Details

Trials were planted on 15-acre farm fields with two soybean varieties per field to compare agronomic performance under similar growing conditions. The assessment will include:

- The effect of row spacing (7.5 inches and 15 inches) on plant health and yield;
- Plant maturity, height, establishment, and root nodule presence; and
- Yield and nutritional qualities.

Preliminary Results

- Feed quality test have showed a crude protein content of 18 to 22 per cent.
- Average acid detergent fiber (ADF) was 28.4 per cent and average neutral detergent fiber (NDF) is 36.3 per cent, which is on par with industry standards.
- Relative feed values ranged from 142-201 with an average of 173, which is considered a high-quality feed.
- 15-inch row spacing produces a plant that has more branches, develops more pods, and higher biomass than 7.5-inch row spacing.
- Varieties with higher heat unit requirements on average produced more biomass.

- Planting should be in the first week of June or at a soil temperature of 15° Celsius. Harvest for silage is typically the third week in September for an average of 105 growing days.
- Seed should be planted at a depth of approximately four centimetres.
- Fields that have been in no-till conditions for consecutive growing seasons are more favorable for no-till soybean planting.
- Soybean seed should be rolled into the soil after seeding to maximize seed to soil contact and ensure efficient germination.
- Full pod maturity has not been achieved, however several varieties have come close.

Agriculture Industry Benefits

Soybean is a promising legume rotation crop that has potential to serve as a high-quality feed that can reduce fertilizer requirements. Feed tests have indicated that soybean silage is a high-protein feed that is digestible and highly palatable. When incorporated into rotations, soybeans can increase soil health, interrupt pest pressures, and reduce inputs in future years.

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