DEMONSTRATION OF INNOVATIVE CORN PRODUCTION TECHNOLOGIES: INTERSEEDING COVER CROPS (RELAY CROPPING), VARIABLE RATE PLANTING, AND STRIP TILLAGE

FARM ADAPTATION INNOVATOR PROGRAM | RESEARCH SUMMARY | FEBRUARY 2019 - JANUARY 2023

Geographic Applicability

- Research location: Vernon, North Okanagan
- Applicability: Corn production regions of interior; Okanagan, Shuswap, Boundary, Kootenay, Thompson-Nicola, Cariboo

Commodity Relevance

- Corn Silage
- Corn Grain / Snaplage
- Grazing Corn

Practical benefits

- Interseeding cover crops: Forage production and extending grazing, soil health, nutrient retention and improved nutrient use.
- Variable Rate: Potential economic benefits, improved placement of inputs including nutrients.
- Strip Tillage: Reduced tillage and thus reduced erosion, improved water retention and infiltration, soil structure and health, improved nutrient placement, improved profitability, reduction of fuel use / emissions.

Project lead

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Research Team

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Project Overview

This project was to demonstrate and provide local data / experience with innovative corn production management techniques that relate to a wide range of climate change adaption objectives. The practices were undertaken in silage and grain corn and include interseeding cover crops (relay cropping), variable rate plant population and strip tillage.

Climate change adaption objectives include: increasing yields and productivity, improved utilization of soil and applied moisture, reduction of erosion, improved nutrient use and reduction of nutrient loading, improved soil health and structure, forage production for extending the growing and grazing season, agronomic resilience, cost-benefit analysis and reduction of fuel use / emissions.

Figure 1. Corn growing in strip tilled field

KEY FINDINGS

INTERSEEDING

Interseeding cover crops was very effective if performed at the correct timing and with allowable moisture. This resulted in soil improvements and some forage production. We were able to produce up to 0.8t/ac of dry matter post harvest when utilizing Italian ryegrass, clovers and forage brassicas. While it was not enough to harvest mechanically it would be enough to be utilized for fall grazing at a net benefit 3 out of 4 seasons. The forage quality was excellent and higher quality than required for beef cows in the 2nd trimester. Additional trials were conducted utilizing solar corridors: a 60" wide space seeded to cover crops with high plant populations on the edge rows of the corn in order to maintain overall field corn plant population (Figure 3). These were found to have excellent potential as we were able to maintain the overall corn yield both as silage and grain, and produce up to 1mt/ac of dry matter in the solar corridor. This could have potential to be integrated with other grazing or strip intercropping techniques. It was also found that Italian ryegrass has potential to overwinter in this region.

VARIABLE RATE PLANTING

While it has applicability, other factors prevented variable rate corn planting from reaching its full potential in this project. When adequate soil fertility and moisture were available, increasing plant population from 29,000 plants / acre to 42,000 plants / acre also increased yield both as silage and grain corn and had a positive economic return. However we experienced issues with limited moisture more than once during this project, which resulted in no response to higher populations. While we identified soil zones and utilized some yield information to create variable rate populations, we may not have varied the population enough or identified irrigation issues well enough to get a full response. A side benefit of the technology that allows variable rate planting is row by row shutoffs that prevent overlap on headlands and save product.

Figure 2. Intercrop forage blend post grain corn harvest.

Figure 3. Solar corridor forage.

KEY FINDINGS

STIP TILLAGE

Strip tillage was very successful, resulting in higher profitability, improved soil structure and infiltration, reduction of erosion, reduction of fuel use / emissions and improved nutrient placement. Utilizing estimated custom rates and average equipment sizes for an operation growing 125ac of corn, we found a savings of $80/acre for strip tillage vs. conventional tillage and nearly 80 hours of time saved over the 125acres. While there was some yield and maturity drag especially in the first two years, it is offset by the benefits and cost / time savings. Challenges with pests and alternate timing of weed flushes also required crop management adjustment.

This project was not without weather, climate and management challenges and their impact on results was also valuable.

Figure 4. Strip Tillage rows before planting in grain corn residue.

RESEARCH METHODS

Intercropping cover crop was performed by seeding into the standing corn at leaf stages V4-V6. It is also referred to as relay cropping. It was conducted at two sites over the four years with treatments of check, cover-crop and the solar corridors. The treatments were harvested as grain and silage, and the cover crop was hand harvested and weighed for yield and tested for quality. Impacts on soil moisture, nutrients and qualitative analysis was assessed. Solar corridors were planted by turning off one row of the planter leaving a 60" gap, rows adjacent to the gap were planted at a heavier rate (up to 60,000 plants / acre) in order to maintain overall field population and take advantage of the solar "edge-row" effect.

Variable rate population was conducted by planting strips six rows wide at different populations ranging from 29,000 plants/acre to 42,000 plants / acre. Once data was obtained on soil types and yield, a variable rate population strip was also added. Yield and harvest characteristics were measured as well as impacts on plant health, weed pressure, soil moisture and forage quality.

Strip tillage as conducted by building a strip tillage machine using Dawn Pluribus V row units. Strip tillage was performed in spring a few days to a few weeks before planting into a number of previous crop residues including corn silage and grain, barley, forages, and standing fall rye. Corn was then planted into the pre-formed strips and monitored for soil moisture and temperature, plant health, yield and quality.

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