

Dry Bean Intensive Management Soil Health Study (Interim Report)

Purpose:

Dry bean yields depend on a number of factors. Disease can have a big impact on yields. Although they are legumes they don't seem to produce enough nitrogen for optimum yields so additional fertilizer or manure is added. One part of this study will look at several nitrogen rates and disease management. Many growers try to plant dry beans on their best fields or on fields they rent from neighbours which have just come out of hay or fields that receive regular amounts of manure as they produce the highest yields. The second part of this study will attempt to evaluate the soil health of the fields using a number of soil health indicators. If there is good correlation between the soil health indicators and yield the indicators could be used to help a grower predict which fields will produce the highest dry bean yields.

Methods:

Eight fields were chosen for the study in the London to Kippen area. The fields were set up with small plots replicated four times and longer strips in the field replicated three times. Fertility, nitrate and potentially mineralizable nitrogen samples were taken from each of the treatments. Four rates of nitrogen (0, 35, 70, 105 kg N/ha) were applied to the small plots and strips. Three locations down the strip were selected, loosely based on topography (upper, mid and lower slope position), where crop growth (10 plant dry matter, plant height and development stage measurements at 4, 6 and 8 weeks after planting), water infiltration and soil compaction measurements were taken. The crop growth measurements were taken two times throughout the season and hand harvest yields at the end of the season. Plot combine yields were taken from the small plots and the grower combined and weighed the strips.

Results:

Figure 1 below provides the average scores of seven of the soil health indicators used for the fields. The infiltration and soil compaction numbers are still being analyzed as is the crop growth and yield data. The scoring of these indicators is based on the Cornell Soil Health Assessment. More information can be found at <http://soilhealth.cals.cornell.edu/>. Four of the soil health indicators are chemical (nutrient) based. The scoring for each is out of 100 and is based on adequate nutrient levels or pH. Six out of the eight sites had lower than optimal phosphorus levels and five out of the eight had lower micronutrient (magnesium, manganese and zinc) levels. The potassium and pH levels were optimal at all sites. The Potentially Mineralizable Nitrogen (PMN) indicator reflects the capacity of the soil microbial community to convert (mineralize) nitrogen tied up in complex organic residues into the plant available form of ammonium. Only two of the sites scored in the mid-range and the rest had low scores. PMN is a biological indicator as is soil organic matter. There were three sites that scored in the mid-range for organic matter. The final indicator, aggregate stability, is considered a physical indicator. In this test, aggregates 0.25mm to 2mm are subjected to 1.25 cm of rainfall in five minutes representing an intense rainstorm. Three sites scored high for this indicator while four scored moderate and one poor. Poor aggregate stability usually

means the soil will seal over and crust easily slowing water infiltration into the soil. These factors are commonly referred to as problems in edible bean production. Poor aggregate stability also means the soil is more prone to soil erosion. Two of the sites had high total scores and the rest were in the moderate range. Field history information will be combined with the other data that has not been analyzed yet to complete the soil health assessment on these fields. The intensive sampling done in this project also will provide us with an opportunity to assess the variability of soil health indicators within a field.

Figure 1. Average Soil Health Indicator Scores

Location	P Score	K Score	PMN Score	pH Score	OM Score	Micro-nutrient Score	Aggregate Stability Score	Total Score (out of 100)
KippenC	90	100	14	100	29	43	46	60
KippenJ	50	100	10	100	34	73	41	58
ExeterD	54	96	30	100	26	40	71	60
ExeterRS	31	100	26	100	17	89	16	54
StMarysH	100	100	14	100	58	98	71	77
LondonE	67	100	49	100	71	100	81	81
LondonC	50	100	10	100	33	43	50	55
StMarysP	22	100	48	99	56	90	67	69

Summary:

The soil health indicators did show differences between the eight sites. Fields under good soil management practices generally had higher soil health scores. The greatest differences were shown by the aggregate stability and phosphorus indicators.

Next Steps:

Complete the analysis of all of the data. The study will continue for up to two more years.

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