2012 Fraser Valley Soil Nutrient Study Sampling Methodology

Revised December 2015

Introduction

In response to the lack of comprehensive data documenting the nutrient status in British Columbia's agricultural soils, the Fraser Valley Soil Nutrient Study was initiated in 2005. In 2005, a baseline dataset of residual soil nitrogen, phosphorus and potassium (N, P and K) of selected regions and crops was obtained by sampling 172 fields across the Valley. Overall, the study indicated a need to pay close attention to the accumulation of N, P and K in agricultural soils. The intention was to repeat the study over the long term, in order to monitor nutrient trends and help evaluate the effectiveness of Nutrient Management Planning within the Canada-BC Environmental Farm Planning programs.

The first repetition of the Fraser Valley Soil Nutrient Study was conducted in 2012. Post-harvest soil samples were collected from 177 agricultural fields extending from West Delta to East Chilliwack, which were volunteered by 97 producers. Intensive sampling was conducted from mid-August to mid-October in forage grass, forage corn, vegetable, blueberry, raspberry, and nursery fields. The regions and crop groups were the same as those sampled in 2005, and were selected as a statistical representation of soil parent materials and cropping practices in the Fraser Valley. The six sample regions are economically important production areas with contrasting nutrient surpluses that have been identified in previous census-based studies (Schreier et al., 2003; Brisbin, 1996).

In 2005, the representation of fields per region and crop group was proportional to the land use in hectares, and 50% of the fields sampled were forage grass. In 2012, the sampling was distributed more evenly across regions and crop type in order to increase the sample numbers in each category (Table 1). Sampling was repeated on as many of the 2005 fields as possible for comparative analysis between the study years; 109 of the 2005 fields were re-sampled in 2012 (representing 62% of the 2012 fields). Figure 1 and Table 1 illustrate the breakdown of the 2012 soil sampling by region and crop type.

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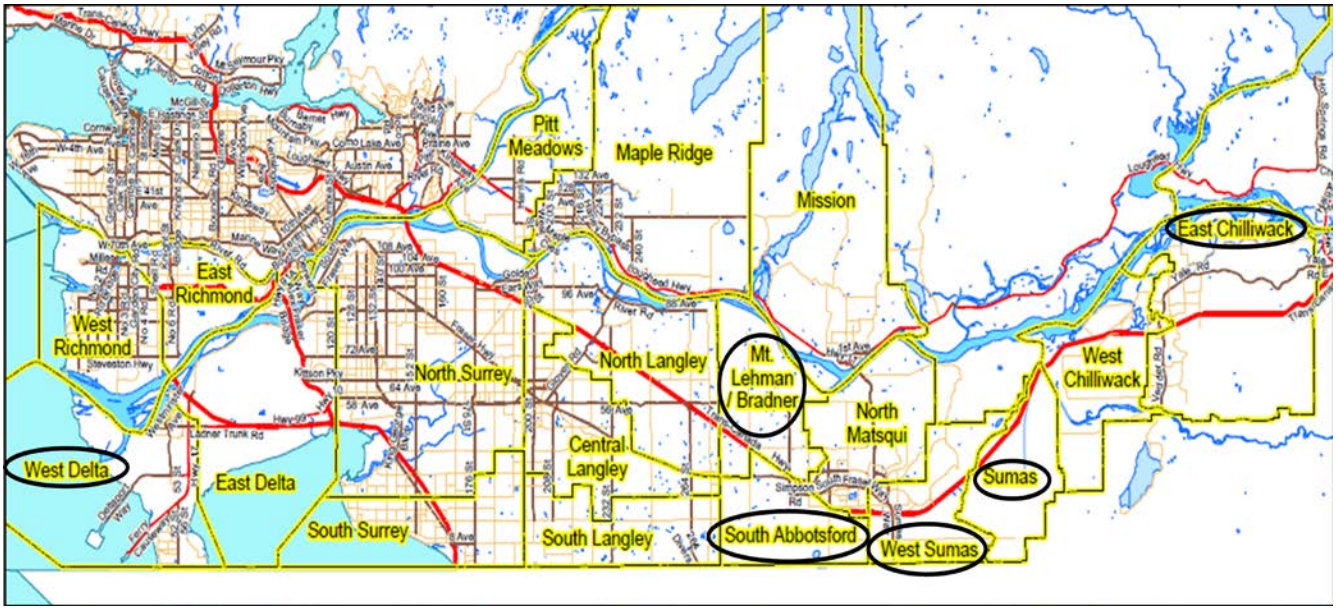

Figure 1. Locations of the six geographic regions sampled in the Fraser Valley Soil Nutrient Study (circled).

Table 1. Breakdown of field sampling by region and crop for the 2012 Fraser Valley Soil Nutrient Study.

Crops	West Delta	Mt Lehman /Bradner	South Abbotsford	West Sumas	Sumas	East Chilliwack	Total
Forage grass	5	10	5	9	5	11	45
Forage corn	-	-	-	12	8	11	31
Vegetables	15	-	-	-	15	-	30
Blueberries	5	5	14	-	6	-	30
Raspberries	-	-	19	-	-	-	19
Nursery	-	7		-	-	15	22
Total	25	22	38	21	34	37	177*

* 109 of the 177 fields were sampled in both 2005 and 2012, but were not necessarily growing the same crop in both years. The repeated fields growing the same crop in both years were: 31 forage grass fields; 9 forage corn fields; 18 vegetable fields; 11 blueberry fields; 8 raspberry fields; and 8 nursery fields.

Sampling Methodology

Each field was sampled using a traditional soil core device and recognized sample collection handling procedures. The soil surface was scraped before sampling to remove any fertilizer pellets, manure, mulch, or crop residue that may have influenced the samples. The layer of sawdust was removed in blueberry fields in order to sample mineral soil only. With the exception of the berry crops, samples were collected from randomized patterns that represented the entire field. Blueberries and raspberries were only sampled within the rows. A modified random sampling program was used on the field grown nursery sites. There were 15 sampling points for each replicate. All samples were collected from three depths (0 to 15 cm, 15 to 30 cm, and 30 to 60 cm) to capture soil layers of agronomic and

environmental importance. The surface layer represents the plow layer where most agricultural activity and soil mixing occurs; the 15 to 30 cm layer is the rooting zone for many crops; and the 30 to 60 cm measurement at depth captures nutrients that are at risk of leaching. Soil NO_3-N is very mobile and can move through the soil profile with water, while soil P and K are more stable and tend to accumulate in the 0 to 15cm layer.

Sampling approach based on crop

1. Forage grass, forage corn and vegetable crops generally receive nutrient applications via broadcast spreading and some banding; therefore, sampling was performed randomly within the field. Three random patterns (Figure 2) were followed in order to capture the most variability within the fields.

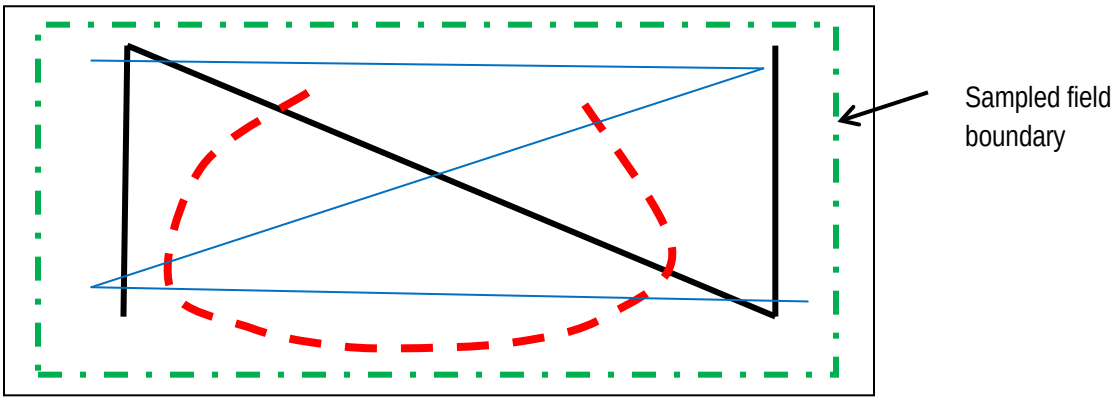

Figure 2. Typical random sampling patterns used (U, N, Z).

2. Raspberry and blueberry crops receive nutrients primarily at or near the base of the plant and the rows cannot be crossed. A modified sampling pattern was used with each replicate sampled up one row and back down another, using paired sampling (Figure 3). The spread of replicates was dependent on field size.

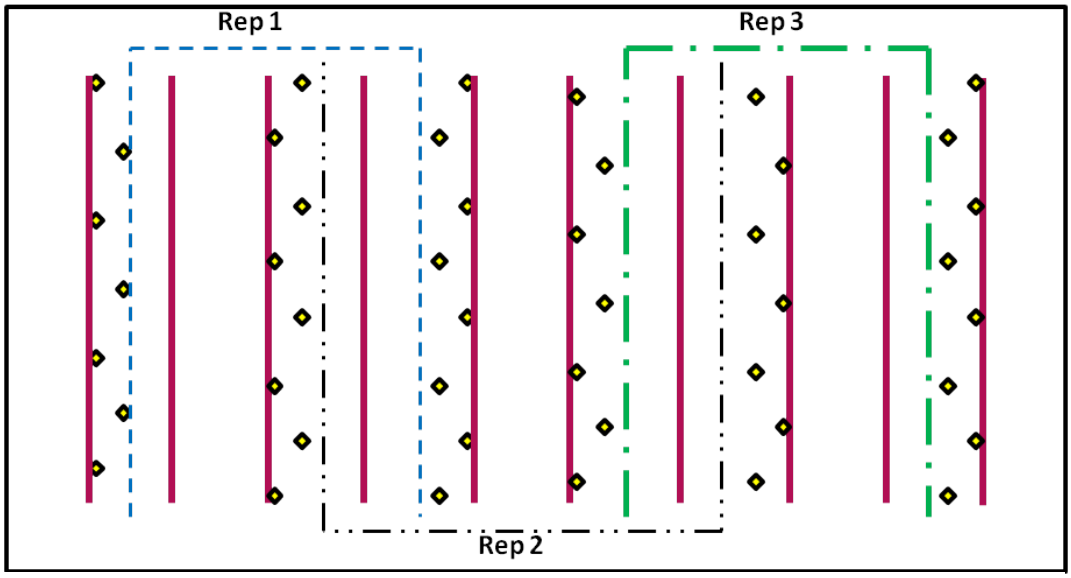

Figure 3. Typical sampling pattern for perennial berry fields. Not to scale.

- For raspberry fields a pair of samples was taken from sites 1 & 2 (Figure 4):

  1) the base of the root mound along the row (where it meets the inter-row)
  2) the centre of the root mound, at the base of the plants in the row

- For blueberry fields the mulch was removed and a pair of samples was taken from sites 1 & 2 (Figure 5):

  1) between the plants in a row (at dripline if small plants)
  2) the base of raised bed, at the dripline

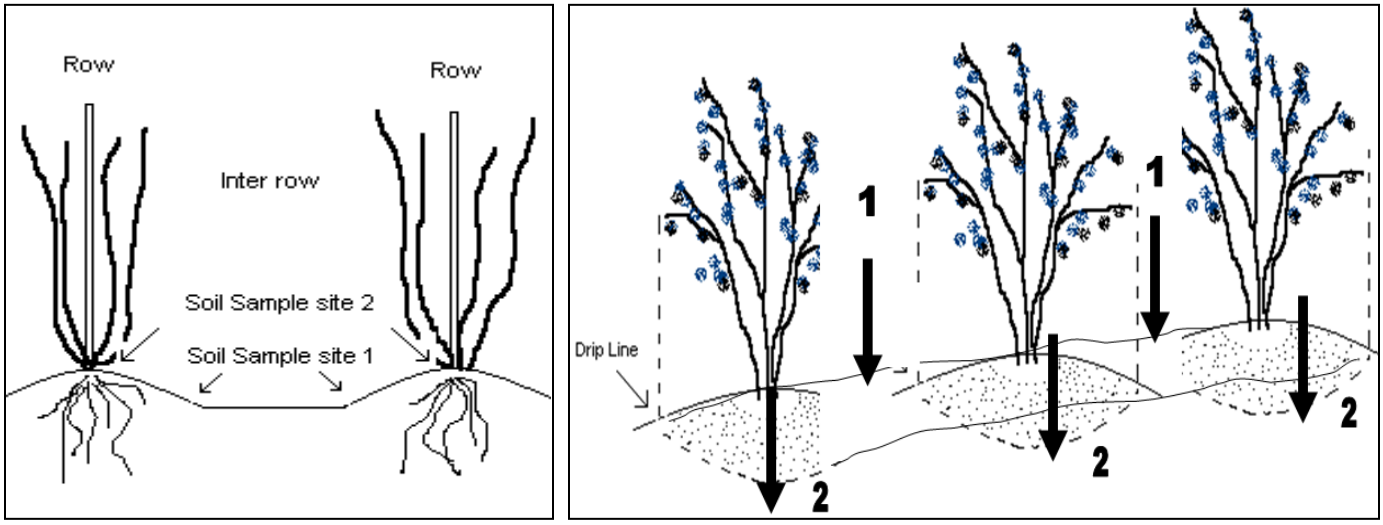

Figure 4 & 5. Sampling locations used in raspberry fields (left) and blueberry fields (right).

3. Nursery crops are only fertilized within the crop rows, and therefore were sampled randomly across the field, but within the crop bed. The alleyways between crop rows were not sampled.

Presentation of results

In the FVSNS factsheets and report, soil nutrient results are presented by depth as a concentration in parts per million (ppm; mg per kg dry soil) or on a volume-basis in kilograms per hectare (kg/ha or kg ha^{-1}). Results were converted from ppm to kg/ha assuming a common bulk density of 1200 kg/m^3 for all depths and all fields sampled. Each 15 cm depth of the profile was multiplied by 1.8 to convert from ppm to kg/ha, and each 30 cm depth was multiplied by 3.6. Once converted to kg/ha, depth increments were added to express a cumulative result.

for example – soil N = 45 ppm at 0-15 cm, 30 ppm at 15-30 cm, 12 ppm at 30-60 cm
soil N = 81 kg/ha at 0-15 cm, 54 kg/ha at 15-30 cm, 43 kg/ha at 30-60 cm
soil N = 81 + 54 = 135 kg/ha at 0-30 cm
soil N = 135 + 43 = 178 kg/ha at 0-60 cm

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