5.3.1 Estimation of Crop Yield

PURPOSE

This hand-out describes a generic method for estimating yield in blueberries. The sampling protocol described is suitable for any size farm or growing situation, regardless of whether plants are grown in containers or in-ground.

KEY POINTS

- Careful selection of monitor plants is essential for accurate yield prediction
- Monitor plants must be representative of the block
- Three rounds of counting are recommended
- Two or three people sharing the workload improves accuracy with counting

BACKGROUND

Crop profiles provide a complete production story using data collected from marked sample plants located throughout the crop. The same sample plants can be used for multiple purposes, including yield estimates, pest monitoring, leaf nutrient sampling, EC pot surveys and calculating water requirements. Data collected over several years can be collated and assessed. This allows growers to:

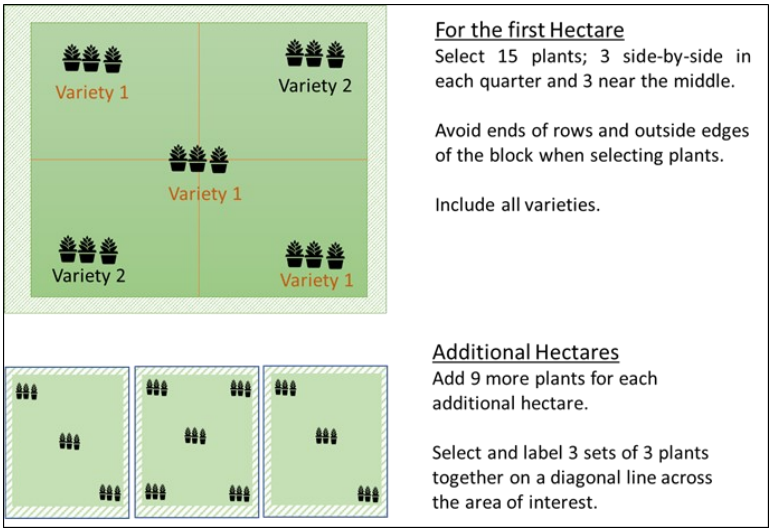
- Predict yield and harvest date with greater accuracy.
- Identify efficiencies that lead to higher productivity and profitability, lower input costs, optimised water and fertilizer use, minimal pesticide use.
- Tailor farm management decisions to specific requirements thereby reducing risk.
- More effectively manage fruit through grading lines; reducing costs and improving profitability.

Methods for estimating YIELD are described in this hand-out. It is one in a series of hand-outs on crop profiling.

SELECT MONITOR PLANTS

The minimum number of plants required for yield assessment on the FIRST HECTARE is fifteen plants per hectare; comprising 5 sets of 3 plants. More plants may be required on sites with variable topography. Include all varieties planted on your block in the overall assessment.

Choose plants that are typical of your site. Look critically at the site and include any areas that might affect the overall average yield. For example; there might be areas that are heavily shaded early in the morning and therefore colder than average; or in a steepish valley and affected by occasional water logging. These areas should be included in the monitoring process.
Avoid the ends of a row when selecting plants. Outside edges of a block are also best avoided.



A typical set-up would be to roughly divide the block into 4 quarters. Select 3 plants together in each quarter, plus 3 plants near the middle of the block (Figure 1).

Then, add 9 more plants to the sampling plan for each additional hectare (Figure 1).

Figure 1: A template for selecting monitor plants

IDENTIFY PLANTS

Fencing-standards are a good way to identify your chosen plants, but any other long-lasting stake can be used. Label plants individually with the Variety, Plant Number and Location (Figure 2). Enter this information into the Excel Spreadsheet Columns A-E as shown in the example below (Figure 3).

Note: You can enter data directly into the Excel spreadsheet for instant calculation of yield. Alternatively, download and print the spreadsheet if you prefer.

Use a new spreadsheet for every round.

Figure 2: Labels clearly identify monitor plants

COUNTING FREQUENCY

Three rounds of counting are carried out over the fruit development phase, starting in May. The first round provides a rough estimate of yield which is then refined with greater accuracy over the following weeks in the next two rounds. Counting should take about 45 mins per hectare to complete on each occasion.
We recommend at least two people for the task. Counts will be more accurate when you can consult with each other, check numbers, and verify data entry.

Tip: Find a friend. Data recording is easier and more accurate when the task is shared.

					Counts and Calculations								
A	B	C	D	E	F	G	H	I	J	K	L	M	N
Date:					Main Shoots	fruiting terminals	fruit buds per terminal	flowers per fruit bud	fruit per bud	Pollination (% fruit set)	Berry weight (g)	Estimated Kg/plant	
Variety	Location	Tunnel	Plant	Rep								After Pollination	After Grading
											Ave		
Area Planted (Ha)													
Number of plants													
Plants per Ha													
	Total Yield After Grading												
	ESTIMATED	ACTUAL											
Production (T)/Ha	0.0												
Adjusted for grower (T)	0.0												
Trays (125g x12)	0												

Yield Calculation is:
total flowers x percent fruit set x berry weight
minus any fruit loss after pollination

Figure 3: Excel data sheet for yield calculation

ROUND 1 - PRELIMINARY ESTIMATION

Start counting in early May – when vegetative growth has terminated. Fruiting Terminals (also known as Laterals) are fully extended at this time and swollen fruit buds are visible on the tips of the shoots (Figure 4).

Assess the plant's framework and count the number of Main Shoots at the base of the plant. These shoots are brown and scaly; 1cm in diameter or bigger (Figure 5). Enter this number into the spreadsheet in column F.

Count numbers of fruiting terminals (laterals) on the entire plant (figure 6). Enter this number into column G.

Choose 5 random fruiting laterals and count the number of fruit buds on each lateral (Figure 7). Calculate the average fruit buds per lateral and enter this number into the spreadsheet (column H).

Figure 4: Fruit buds in the axil between the stem and base of a leaf

Figure 5: Main structural shoots are brown, scaly and more than 10mm in diameter.

Figure 6: Fruiting terminals are counted over the entire bush

Figure 7: Swollen fruit buds in the leaf axils of fruiting laterals

ROUND 2 - IMPROVED ASSESSMENT

At the beginning of July most fruit buds will be visible. At this stage they are bright green and swollen; they are ready to burst and therefore easier to count (Figure 8).

As previously, choose 5 random Fruiting Terminals and count the number of fruit buds per terminal. Calculate the average and enter this number into a new spreadsheet (column H).
Label one fruiting terminal that has open flowers (Figure 9 and 10).
Count the number of flower buds, open flowers and old flowers.
Enter this number into column I. This will be Total Flowers per Terminal.

Note: The total number of fruiting terminals on the entire bush will be about the same as previously, so you won't need to repeat these counts for the entire plant. Copy and paste the fruiting lateral data from column G into the new round.

Figure 8: Bright green fruit buds ready to burst

Figure 9: Fruiting lateral with flower buds, just before opening

Figure 10: Open flowers emerge from buds on a fruiting lateral (terminal)

ROUND 3 - MORE ACCURATE PREDICTION AFTER FRUIT SET

In late August or early September, most flowers will have opened and been pollinated by bees. Fruit set will have occurred. At this stage a third round of counting can be completed. Counts of buds, flowers and fruit after fruit set will provide a more accurate assessment of yield than in the previous months.

Repeat previous counts and enter data into the right columns of a new spread sheet.
Count numbers of fruit on the labelled laterals (Figure 11) and enter this number into column J – This will be total fruit per lateral.

Remember to enter the date of counting every time you start a new round or spreadsheet.

Figure 11: Green fruit a few weeks after pollination

Berry weight
When the fruit are ripe as in figure 12, pick a sample of 50 random berries from each of your monitor plants. Weigh each berry individually. Record the weight and calculate the average value. Enter average berry weight in grams into Column L of the spreadsheet.

Figure 12: Ripe blueberry fruit

CALCULATIONS

Pollination or Percent Fruit set = (Number of Fruit divided by the number of flowers) X 100

Yield per plant = Number of flowers X % pollination X average berry weight MINUS any losses after fruit set

We have used a default of 20% in the on-line calculator for losses after fruit set. Loss of fruit can occur for many reasons, including plant stress, insect or bird damage, disease, poor pollination. Some losses will occur in the packhouse and grading lines after harvest. These losses need to be accounted for in the overall yield assessment.

After harvest and packing you can enter Actual Yield into the spreadsheet.
How good was your prediction?

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