Assessing Canopy Structure of Soybean Plants

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Abstract

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Protocol

Find the Line number

Step 1.

Use a map of the field to find the line number. Each line of Soybean has 4 rows. There are always 5 lines of Soybean next to each other. Between these 5 lines are 'buffers' which contian two rows of generic Soybean (for protective reasons). The lines follow a weaving pattern of accendnig numbers, so the next Soybean line will always be next to the previous one.

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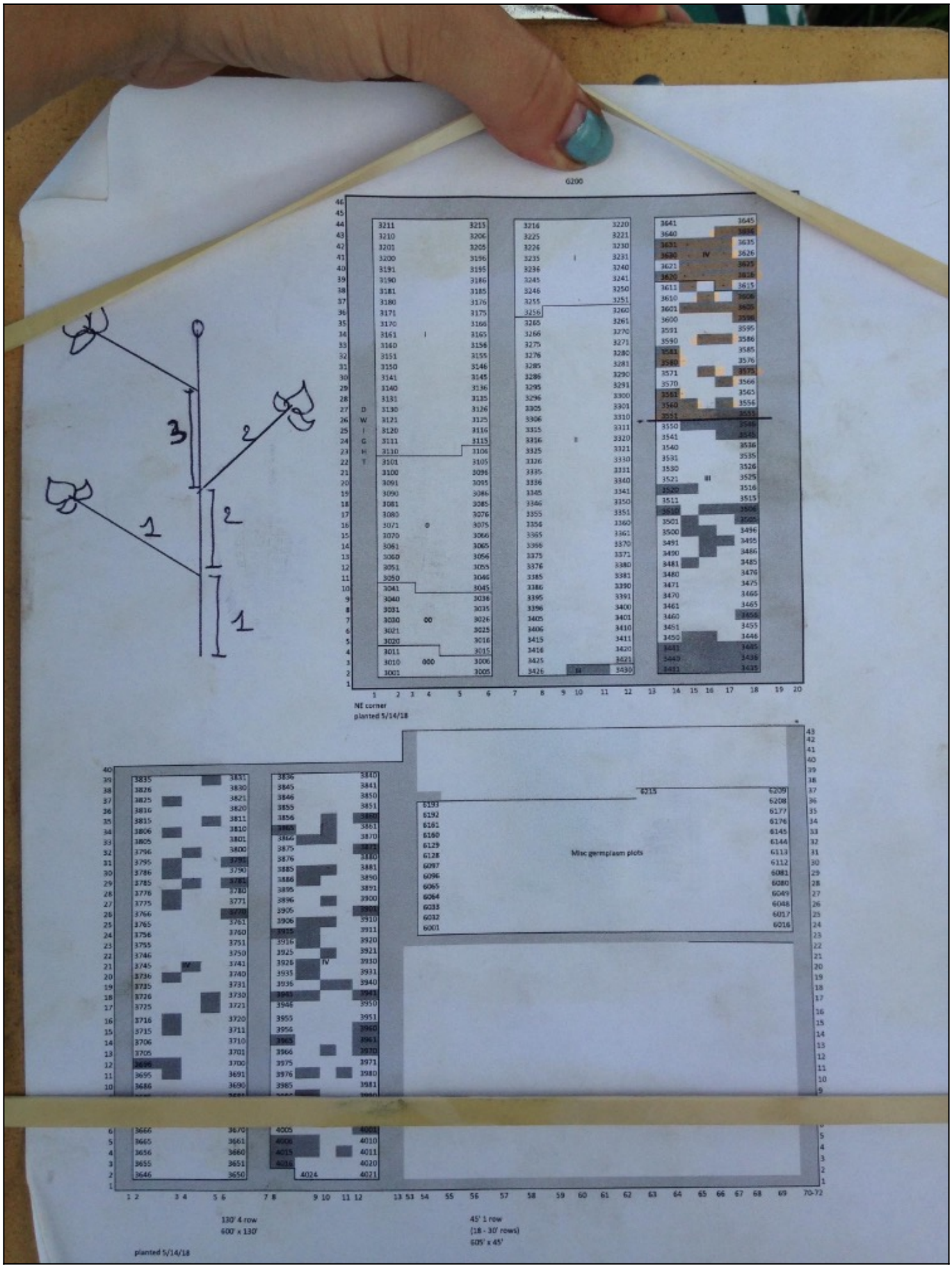

Chose the 2nd and 3rd row

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Step 2.
Sample leaves form the 2nd and 3rd row (the middle ones). This allows the outer rows (1st and 4th) to act as buffers and minise the variation within the line

Choose 3 plants

Step 3.
Choose 3 plants that are representative of the whole line (not too small or too big). Use these plants to take measurements on.

An example of the height variation can be seen below.

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Write down measurements

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Step 4.

Use the sheet below to write down measurements (or an equivilant sheet/spreadsheet).

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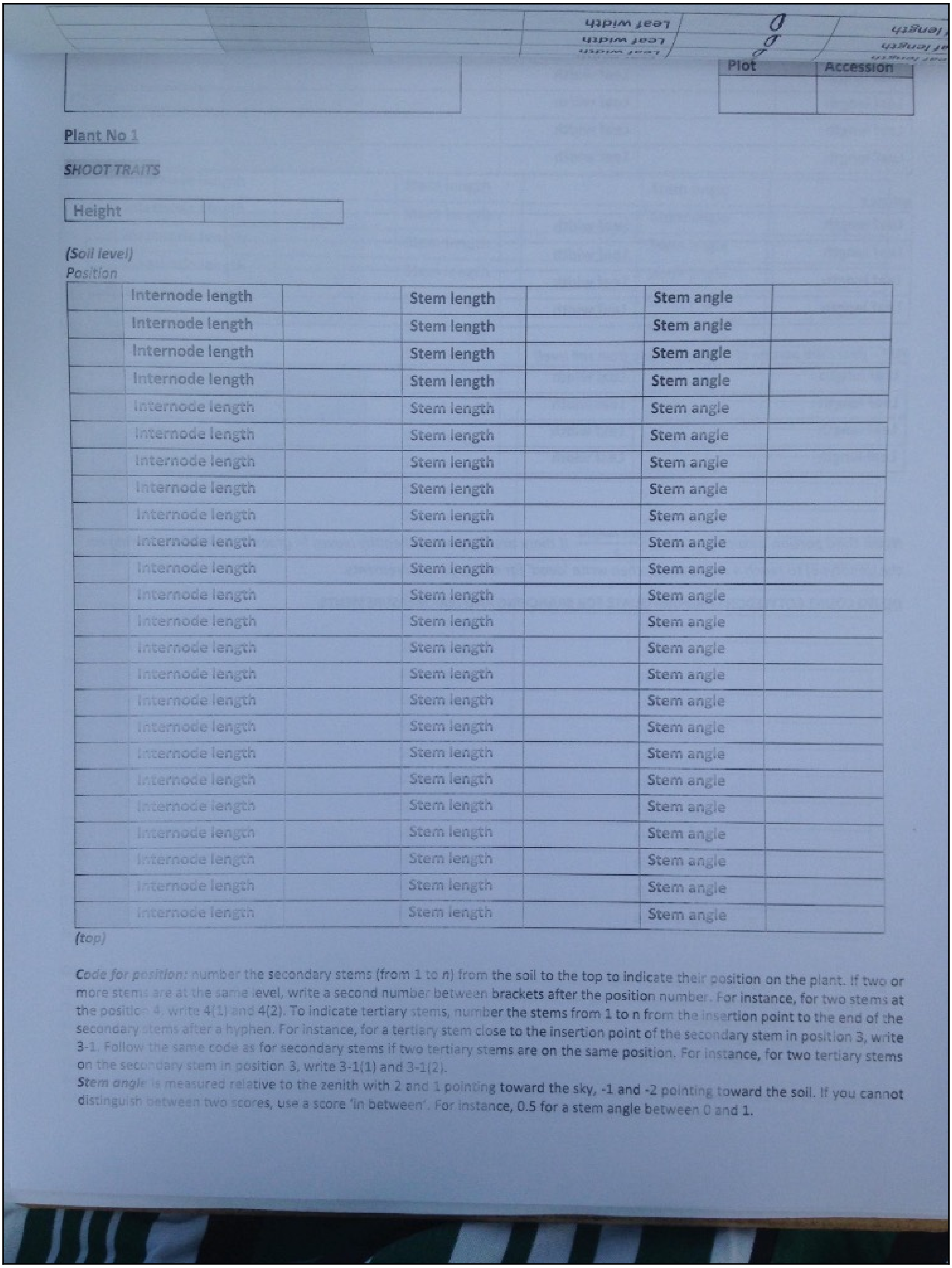

Plot	Accession

Plant No 1

SHOOT TRAITS

Height	

(Soil level)

Position

	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
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	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	
	Internode length		Stem length		Stem angle	

(top)

Code for position: number the secondary stems (from 1 to *n*) from the soil to the top to indicate their position on the plant. If two or more stems are at the same level, write a second number between brackets after the position number. For instance, for two stems at the position 4, write 4(1) and 4(2). To indicate tertiary stems, number the stems from 1 to n from the insertion point to the end of the secondary stems after a hyphen. For instance, for a tertiary stem close to the insertion point of the secondary stem in position 3, write 3-1. Follow the same code as for secondary stems if two tertiary stems are on the same position. For instance, for two tertiary stems on the secondary stem in position 3, write 3-1(1) and 3-1(2).

Stem angle is measured relative to the zenith with 2 and 1 pointing toward the sky, -1 and -2 pointing toward the soil. If you cannot distinguish between two scores, use a score 'in between'. For instance, 0.5 for a stem angle between 0 and 1.

Assess the plant

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Step 5.

Assess each plant in turn. Taking all measurements before moving on to the next plant.

Take a measurement of the overall plant height (cm)

Step 6.

Measure for where the stem reaches the soil (bottom), to the bottom of the top most flower bud (top).

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Measure the height of the internodes (cm)

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Step 7.

For each internode, take a measurement (in cm) of the height of each internode. For the first internode, take a measurement from the ground to the beginning of the internode. Then measure from there to the bottom of another. Continue this until you reach the bottom of the top flower bud.

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Measure the length of the secondary stems (cm)

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Step 8.

At each internode, see if there are any secondary stems (stems which come off the main stem). If there are, measure (in cm) the length of the stem (from the main stem to the base of the end leaf).

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Measure the angle of the secondary stem

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Step 9.

Use the protractor to measure the angle of the secondary stem to the vertical position (90 degrees form the ground). There is a grading system. The grade of 2 or 1 is an acute angle (less than 90 degress), the grade of -2 or -1 is an obtuse angle (more than 90 degrees), in between is the grade 0. If the angle is inbetween two grades (dotted lines), 0.5 can be used.

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Count the number of tertiary stems

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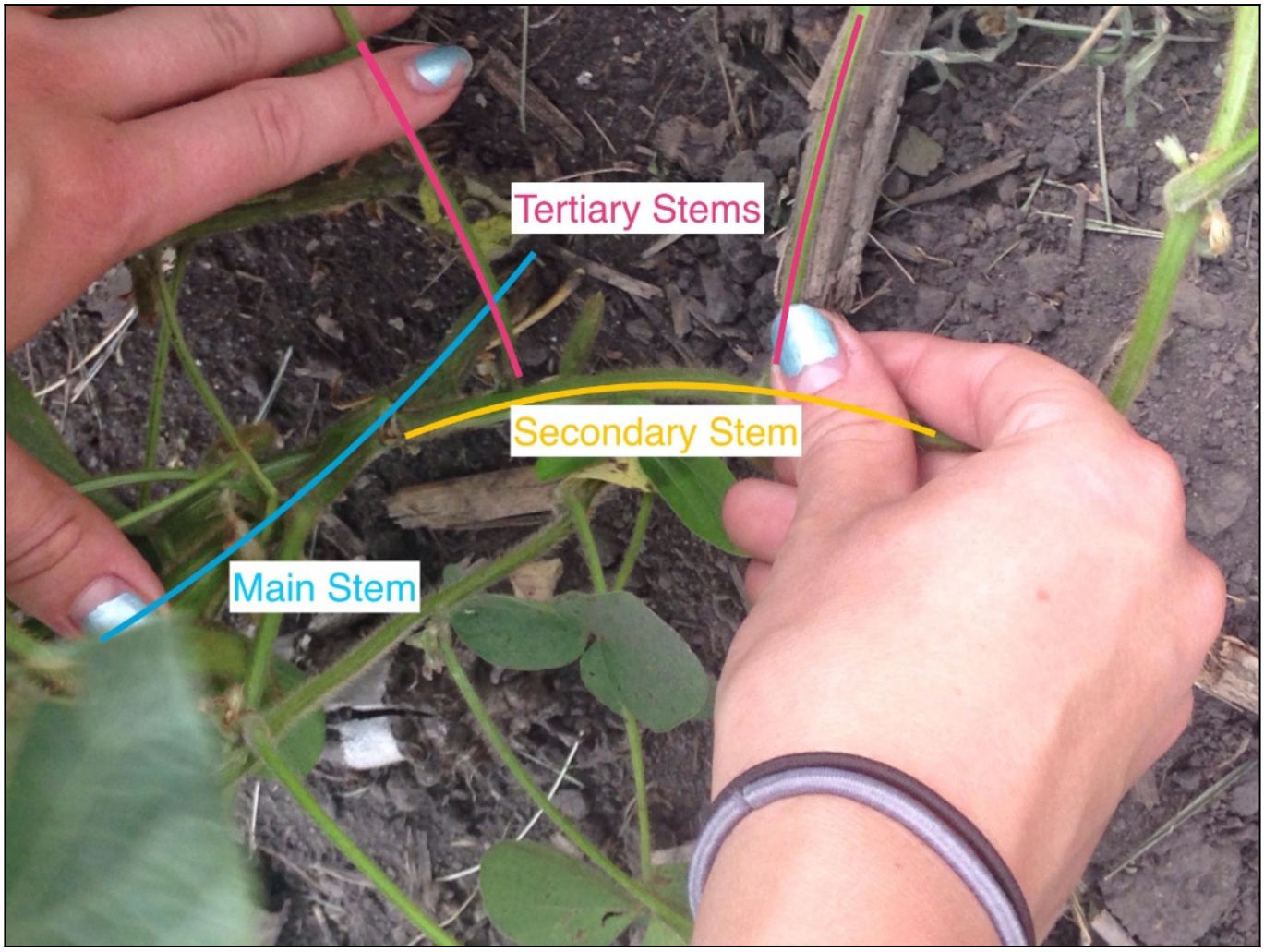
Step 10.
For each secondary stem, count the number of tertiary stems (also called petioles) that come off of the secondary stem.



Repeat up the plant

Step 11.
Repeat these measurements up the plant, internode by internode, until the top of the plant is reached.

Measure the length and width of leaves (cm)

Step 12.
For each plant, divide the height of the plant by 3. Each third represents a different level of the canopy. There is the bottom third (lower canopy), the middle third (middle canopy), and the top third (upper canopy). In each level of the canopy, measure the length and width (cm) of 4 representative leaves. You will end up with 2 measurements for 12 leaves for each plant. Note that here may be leaves in the middle canopy layer, while their secondary stems attach to the stem in the lower canopy level - count these leaves as middle canopy.

Please note, these images show incorrect use of the ruler.

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