Sham Chung Field Study on Woodland

Concept recap

Abiotic and biotic factors of an ecosystem, characteristics of TRF

Enquiry question

Compare geographical characteristics of places or phenomenon	How is the vegetation characteristics of feng shui woodland differ from TRF?
Hypothesis testing	The soil fertility level / soil moisture is higher in woodland than grassland.

---------- PLANNING & PREPARATION ----------

What data to collect?

Primary data

1. Abiotic components
   - Soil nutrient
   - Soil moisture
2. Biotic components
   - Canopy cover, tree height, trunk circumference (expressed as the term "Diameter at Breast Height", DBH below), crown width, shrub height, undergrowth cover

Secondary data

1. Land use of field site (Source: Sham Chung Haven)

When to collect data?

Fieldwork date	
Fieldwork time	
Present weather conditions	
Precipitation THREE days before fieldwork	
Is today suitable for woodland fieldwork? (Things to consider: weather conditions/ some phenomena occur only under specific time)	

Where to collect data?

Sham Chung (refer to the *Map: Fieldwork sites for river and woodland studies*)

Is the field site suitable for woodland fieldwork? (Things to consider: safety/ accessibility/ appropriate scale/ match with fieldwork topic)

How to collect data?

- Work in groups, each of 4 students.
- Those groups will be assigned either to woodland or grassland for data collection.
- A transect line will be set from woodland to grassland.
- Each group records the abiotic components (i.e. soil nutrient and soil moisture) and biotic components (vegetation survey) along the transect line.

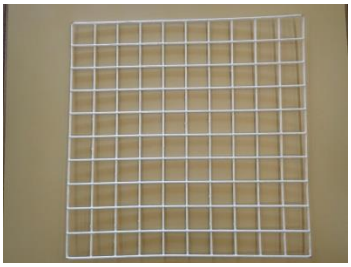
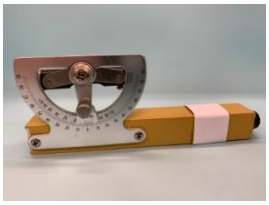
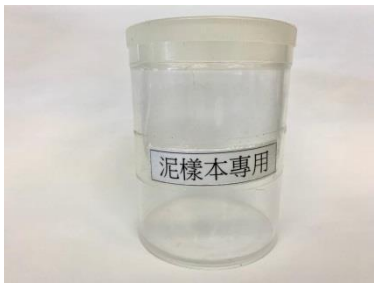
Choose appropriate primary data collection methods and equipment provided and complete the table below.

	Research items	**Primary data collection methods**	**Equipment** *(You may choose more than one)*
Vegetation	Canopy cover		
	Tree height		
	Crown width		
	DBH		
	Shrub height		
	Undergrowth cover		
	Other characteristics of plants: root/ leaves/ lianas		
	Vertical stratification		
Soil	Soil nutrient		
	Soil moisture		

Primary data collection methods

A) Observation	B) Measurement	C) Counting
D) Scoring	E) Interview	F) Questionnaire

Photos of fieldwork and labwork equipment

 		
1. Measuring tape (30m/50m)	2. Vernier caliper	3. Meter ruler
		 
4. Grid quadrat	5. Trowel	6. Abney level/ Rangefinder
		
7. Sample soil bottle	8. Densiometer	9. Soil moisture and temperature meter
		
10. Soil NPK test kit	11. Distilled water	12. Gloves

---------- DATA COLLECTION, PROCESSING & PRESENTATION ----------

Field guide for vegetation survey

1. Set a 50m transect line from the woodland to grassland.
2. Examine **trees** which touch or have their crown projection overlying the transect line.
   - Measure the tree circumference (cm), Height (m), Crown width (m) and corresponding positions on the transect line.
3. Examine the **canopy cover** (%) of trees every 2 metres along the transect line.
4. Examine **shrubs** which touch or have their crown projection overlying the transect line.
   - Measure the Height (cm) and corresponding positions on the transect line.
5. Examine the undergrowth coverage (%) every 2 metres along the transect line.
6. Record the data on Table 1 (p. 10)

Instructions of vegetation survey

1.1 Tree height

- Stand next to the tree trunk and walk away until you can see the top of the tree.
- Use the abney level to measure the angle of elevation (α) from your eye to the top of the tree.
- Use the measuring tape to measure the horizontal distance from the tree trunk (D) to where you took the abney level reading.
- Look through the eye piece, sight at the required point and move the index arm over the scale until the bubble, white line and required point overlap.
- Read the angle on the percentage scale. Record the height from eyes of observer to the ground (H1).
- Record the data on Table 1 (p. 10)

Note:

- The observer should stand at the same height (not on higher or lower slope).
- Do not stand too close to the tree measured.
- Angle should be within 40°, otherwise step backward until the angle is less than 40°.

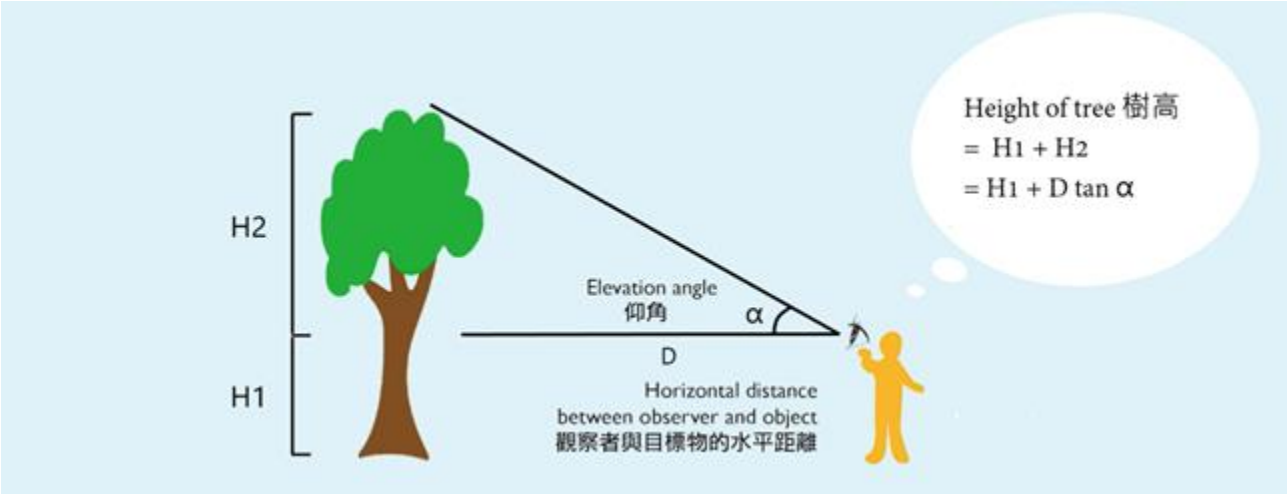


Figure 1 Measure tree height with an abney level

1.2 DBH[1]

- DBH is a standard and common method of measuring tree dimension apart from tree height.
- It refers to the diameter of tree trunk measured at breast level (i.e. 1.3m from ground level).
- Record the data on Table 1 (p. 10)

Note:

- Stand the meter ruler next to a tree to set the level for measurement.
- Make sure the measurement is made perpendicular to the axis of the tree trunk (Figure 2).
- In using the measuring tape, use the formula "D = circumference/π".
- When taking measurement with a measuring tape, never presume the first attempt is accurate. Loosen and re-tighten the measuring tape a couple of times or slide it around the trunk to ensure the tape lies flat and is not obstructed by any swollen parts of the trunk.
- If the stem is covered by lianas or vines, try first to move them and measure DBH below them. If not possible, estimate DBH visually using the backside of the measuring tape.
- For smaller trees/ sapling, use a caliper for measurement. If the smaller tree has an obviously elliptical cross-section, the DBH should be the average of any two caliper measurements taken at right-angle (Figure 3).

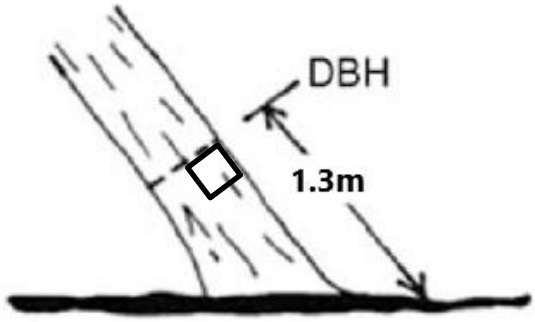


Figure 2 Correct method of measurement

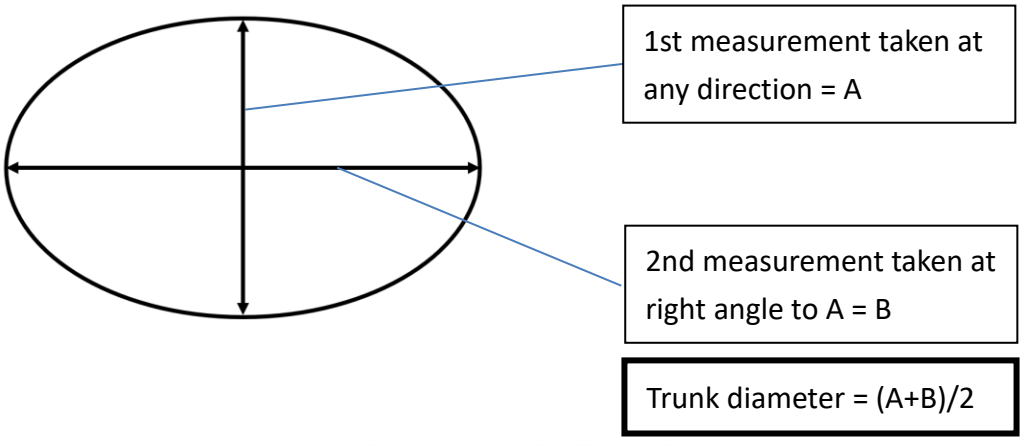
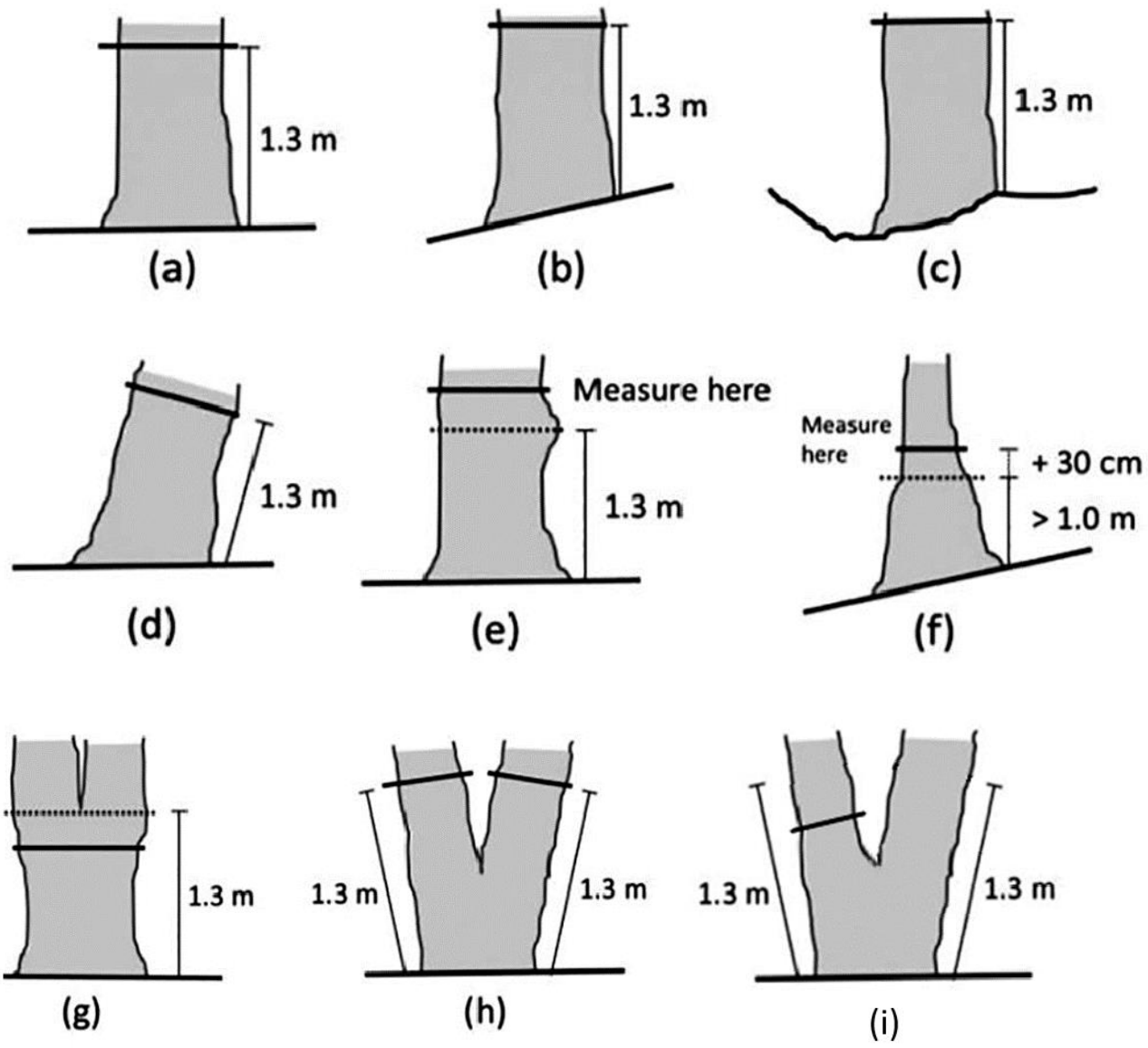


Figure 3 How to measure with sapling with elliptical cross-section

[1] https://www.afcd.gov.hk/english/conservation/con_tech/files/common/NCPN_No.02_measurement_of_DBH_ver.2006.pdf



(a) level ground; (b) slope; (c) uneven ground; (d) if the trunk is bent or inclined; I if the tree has a limb, bulge or other abnormality; (f) if the tree has buttresses; (g) if the tree forks exactly at breast height; (h) if the tree has multiple stems; (i) if the trunk splits less than 1.3m from the ground, measure the smallest circumference below the lowest branch.

Figure 4 Measurement of DBH in different situations

1.3 Crown width

- Tree crown width is measured with a measuring tape by taking two crosswise measurements (one from the direction with the largest diameter and another perpendicular to it).
- The widths of the crown were determined by visual vertical sights.
- Stand next to the tree trunk and observe the shape of tree crown above.
- Walk to the longest spread of crown and measure the crown width (A). Then walk to the longest cross-spread and measure the crown width (B). (Figure 5)
- The average crown width is (A + B)/2.
- Record the data on Table 1 (p. 10)

Note: You can ask the group member to shake the tree to locate the tree crown.

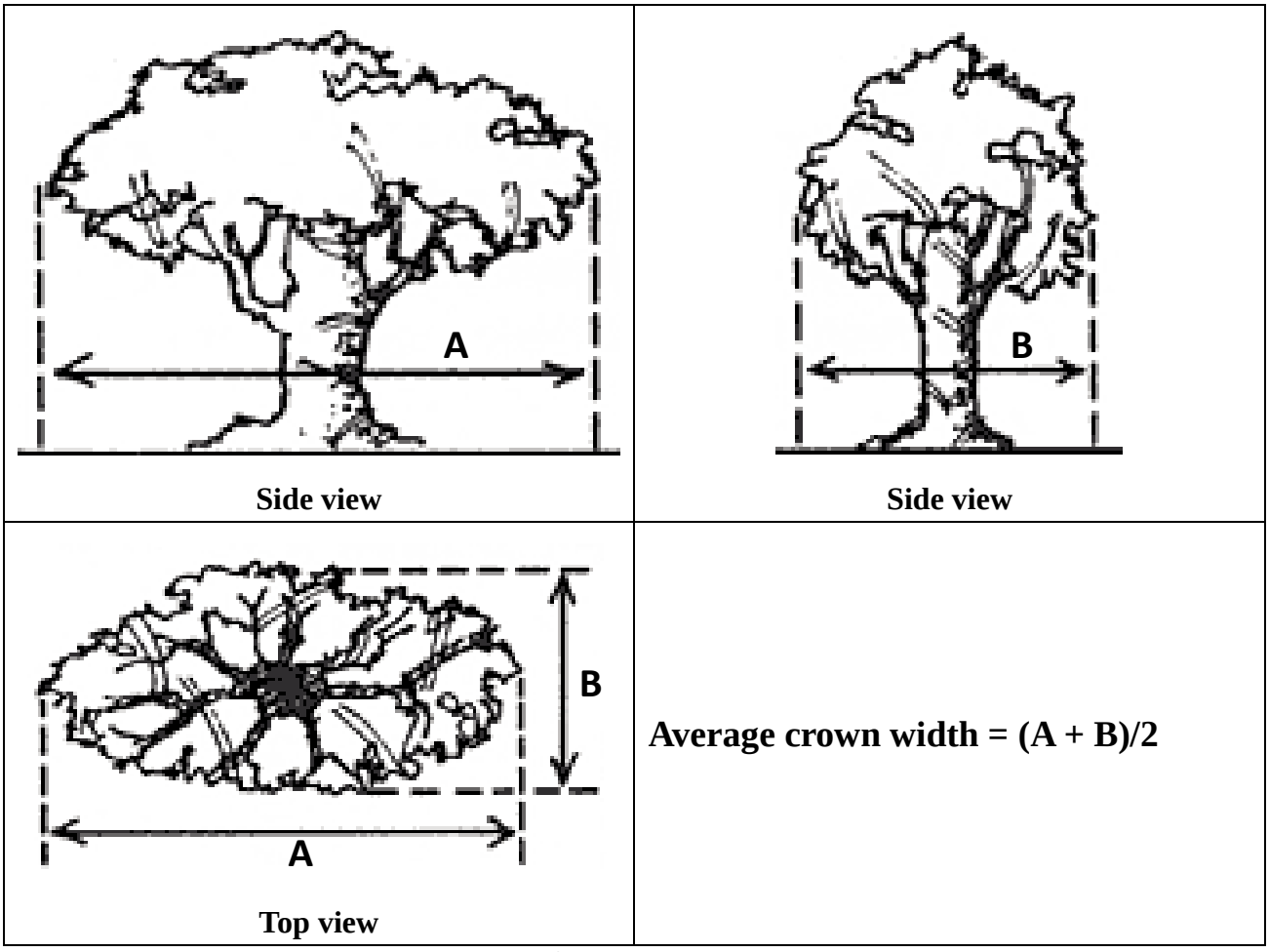


Figure 5 Measurement of tree crown width[2]

[2] http://www.nfcca.org/news/nn201702e.html

1.4 Canopy cover

- Stand next to the transect line, start from 0 metre. Record canopy cover every 2 metres.
- Switch the smartphone into front camera mode. Set the photo frame as **square**.
- Hold the smartphone about 12" ahead at elbow height.
- Take a photo of the canopy and save it.
- Open the photo and cover the densiometer on the canopy photo. Make sure the grids correspond with the photo.
- Count the "green" square out of 25 squares. Then multiply by 4.
- Record the data on Table 1 (p. 10)

2. Shrub height

- Stand next to the transect line.
- Wherever the shrub is in touch or have their crown projection overlying the transect line, take measurement of the Height of shrub.
- Record its corresponding positions on the transect line.
- Record the data on Table 1 (p. 10)

3. Undergrowth cover

- Stand next to the transect line, start from 0 metre. Estimate undergrowth cover every 2 metres.
- Place a grid quadrat next to the transect line, observe and estimate the undergrowth cover.
- Record the data on Table 1 (p. 10)

Instruction on soil study

Soil moisture

- Stand next to the transect line, start from 0 metre. Record the soil moisture every 2 metres.

Soil nutrient

- From the whole transect, take ONE soil sample from woodland and grassland respectively. Take a bottleful of soil sample for labwork later.

Soil NPK Test (N--Nitrogen, P--Phosphorus and K--Potassium)

Equipment:

✓	NPK Soil test kit: Test tube, test tables, pipet, colour chart	✓	plastic teaspoon	✓	aluminum foil
		✓	distilled water		

Preparation for soil NPK test per sample (**EXTRACTION**):

(i) Fill a test tube with 30 ml distilled water.

(ii) Add TWO Floc-Ex tablets. Cap the test tube and mix the solution until the tablets disintegrate.

(iii) Remove the cap. Add one teaspoon of soil.

(iv) Cap the tube and shake it for one minute.

(v) Let the tube stand until the soil settles out. **The clear solution above the soil will be used for the Nitrate, Phosphorus and Potassium test.**

Procedure of **NITROGEN** test:

(i) Use the pipet to transfer 10 ml clear solution (from Extraction) above the soil into a test tube.
(ii) Add ONE Nitrate Tablet. Immediately cover the whole test tube by aluminum foil to avoid the reaction with UV light.
(iii) Cap and mix the solution by inverting the test tube for 2 minutes to disintegrate the tablets. Bits of materials may remain in the sample.
(iv) Wait for 5 minutes. Remove the aluminum foil. Compare the pink colour of the solution with the Nitrogen Colour Chart.
(v) Write down the result on p.11.

OR

Procedure of **PHOSPHORUS** test:

(i) Use the pipet to transfer 25 drops of clear solution (from Extraction) above the soil into a test tube.
(ii) Fill the test tube with distilled water to the 10 ml mark.
(iii) Add ONE Phosphorus Tablet. Cap and mix the solution until the tablet disintegrates.
(iv) Wait for 5 minutes.
(v) Compare the blue colour of the solution with the Phosphorus Colour Chart.
(vi) Write down the result on p.11.

OR

Procedure of **POTASSIUM** test:

(i) Use the pipet to transfer 10 ml clear solution (from Extraction) above the soil into a test tube.
(ii) Add ONE Potassium Tablet. Cap and mix the solution until the tablet disintegrates.
(iii) Compare the cloudiness of the solution with the Potassium Colour Chart.
Hold the tube over the black boxes at the left column and compare it to the shaded boxes in the right column.
(iv) Write down the result on p.11.

****Note: testing procedures may differ due to different test kits.**

Vegetation survey

	Tree[3]										Shrub	Undergrowth*
Transect position (m)	Distance from tree (D)	Elevation angle (α)	Height from eye of observer to the ground (H1) (m)	D x tan α (H2)	Total height (H1 + H2) (m)	Crown width of A (longest spread) (m)	Crown width of B (longest cross-spread)(m)	Average Crown width (m)	DBH (cm)	Canopy cover (%)	Shrub height (cm)	Undergrowth cover (%)

Table 1 Record sheet for vegetation survey

* Belt transect method is used instead of line transect method.

[3] ACFD defines a tree as a plant with trunk diameter measures 95 mm or more at a height of 1.3m above the ground level.

Characteristics of plants		**Rough amount (circle the appropriate)**
☐	Drip-tips	None / Few / Many
☐	Buttress roots	None / Few / Many
☐	Stem flowers	None / Few / Many
☐	Climbers	None / Few / Many
☐	Stranglers	None / Few / Many
☐	Ferns	None / Few / Many
☐	Moss	None / Few / Many
☐	Lichen & fungi (e.g. mushrooms)	None / Few / Many

Table 2 Other plant characteristics in the woodland

Soil study

1. Soil nutrient

Woodland: Sample A taken at _____m

In charge ☑	**Soil Fertility Index**	0 mark	1 mark	2 marks
☐	Nitrogen (N)	Low	Medium	High
☐	Phosphorus (P)	Low	Medium	High
☐	Potassium (K)	Low	Medium	High

Total score	0 – 1 mark	2 – 3 marks	4– 6 marks
Soil fertility	Low	Medium	High

Level of soil fertility	**Sample A**
	Low / Medium / High

Grassland: Sample B taken at _____m

In charge ☑	**Soil Fertility Index**	0 mark	1 mark	2 marks
☐	Nitrogen (N)	Low	Medium	High
☐	Phosphorus (P)	Low	Medium	High
☐	Potassium (K)	Low	Medium	High

Total score	0 – 1 mark	2 – 3 marks	4– 6 marks
Soil fertility	Low	Medium	High

Level of soil fertility	**Sample B**
	Low / Medium / High

Table 3 Soil fertility result

Hypothesis: The soil fertility level is higher in woodland than grassland.

Refer to the soil test results on Table 3, the soil fertility level is lower / higher in woodland than grassland.

2. Soil moisture

Transect location (m)	Soil moisture of woodland (%)	Soil moisture of grassland (%)

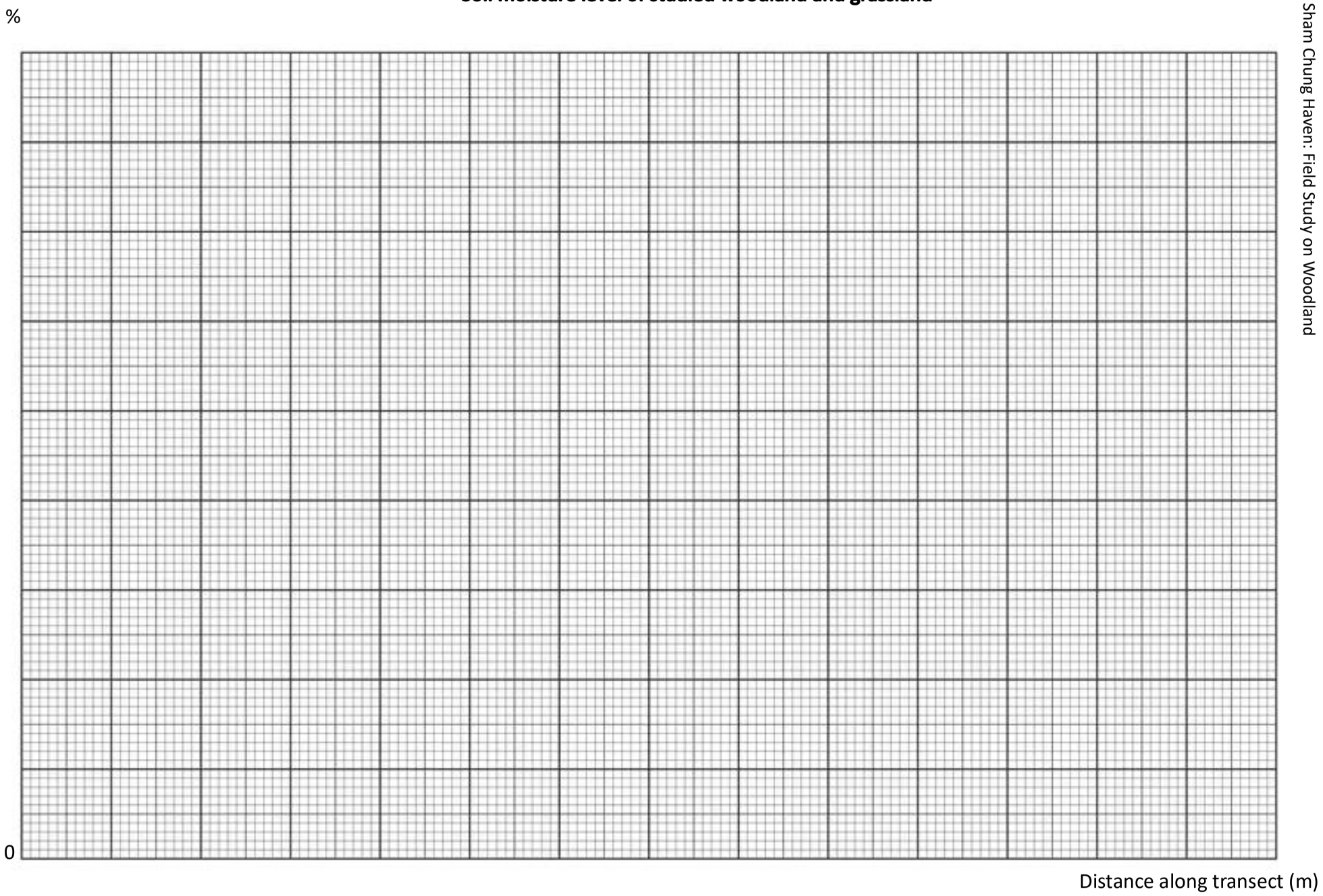
Table 4 Soil moisture of studied woodland and grassland

On the graph paper on p. 13, draw a line graph to show the soil moisture level of the studied woodland and grassland.

Hypothesis: The soil moisture is higher in woodland than grassland.

Refer to the soil moisture result on Table 4, the soil moisture lower / higher in woodland than grassland.

Soil moisture level of studied woodland and grassland

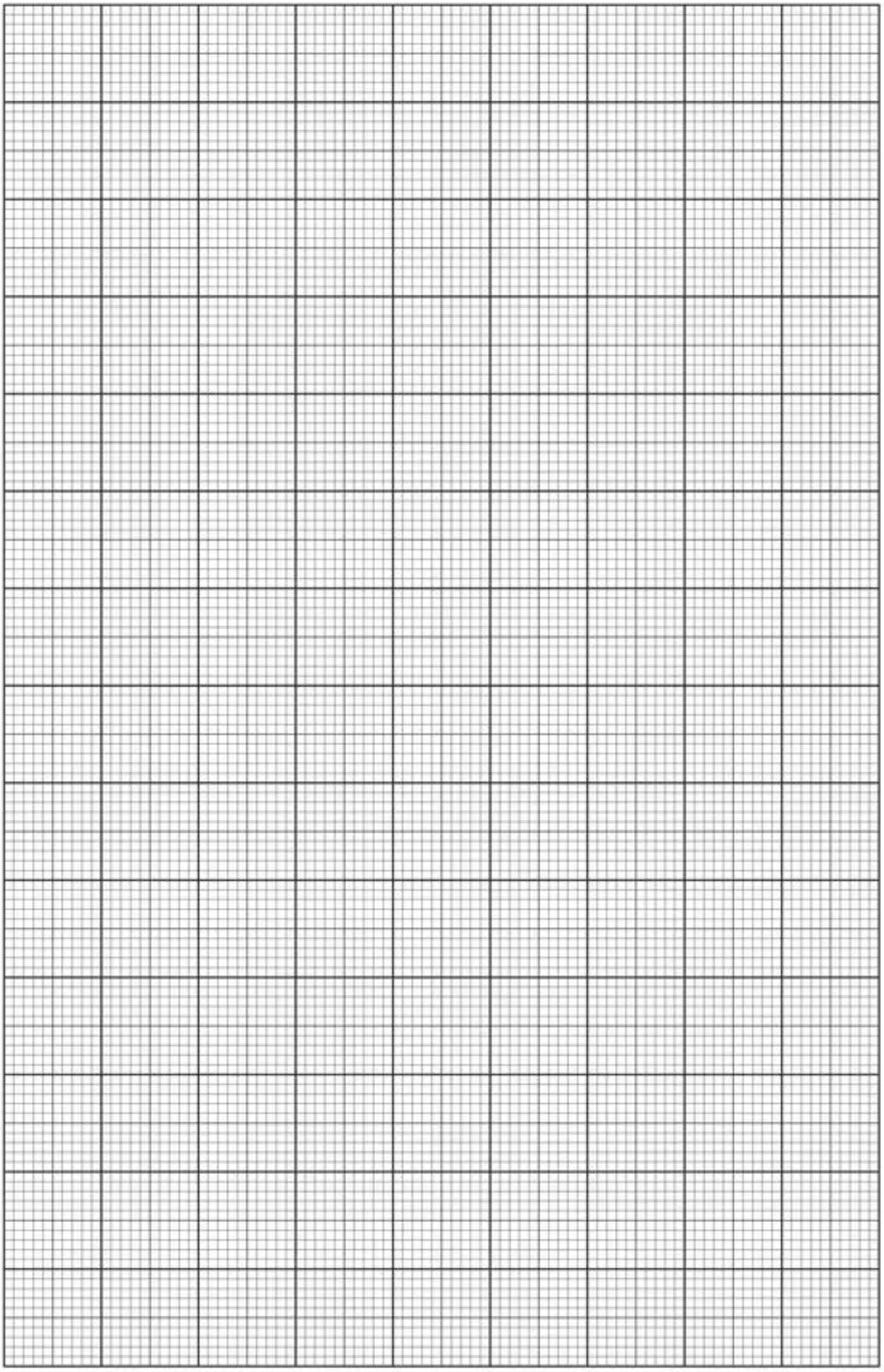


Enquiry question: How is the vegetation characteristics of feng shui woodland differ from TRF?

Draw a plot diagram to show the structure of the studied woodland.

Vertical structure of woodland

Height (m)



Distance along transect (m)

0

---------- INTERPRETATION & CONCLUSION ----------

1. How far is the feng shui woodland similar to TRF? Explain with field evidence and the graphs you have drawn.
2. With reference to field evidence, explain the differences in **soil fertility** between woodland and grassland.
3. With reference to field evidence, explain the differences in **soil moisture** between woodland and grassland.

---------- EVALUATION ----------

1. Are the field sites for woodland study appropriate for the enquiry question? Suggestion alternatives to improve the reliability of data.
2. What sampling methods are used to collect the data of vegetation survey and soil study? Explain the merits and demerits of the methods.
3. Are the data collected sufficient to explain the differences between the studied woodland and TRF? Suggest alternative data to be collected to help answering the above question.

Supplementary information

Belt transect method (see Figure below)

A belt transect is a rectangular area (e.g. quadrat) centred on a line that is set across an area having a clear environmental gradient. In other words, a belt transect can be considered as a widening of the line transect to form a continuous belt or a series of quadrats.

In this method, a quadrat is placed next to the transect line at the starting point (0m) and moved along the transect line at regular intervals until the end of the transect line. Hence, this method collects more data than a line transect.