

Practice quiz question 5

Answer each question in a clearly annotated script.

You should use the format of scripts like the one that was given to you in the first week.

In questions where you are asked to analyse data, you should follow the analysis pathways set out in the lectures, e.g.:

1. Write clear hypotheses
2. Explore descriptive statistics – means, standard deviation, distribution etc
3. Create appropriate plots to visualise/explore data
4. Decide on test(s) to be done (see flow chart)
5. Examine assumptions of tests: normality, variances, independence
6. Carry out tests
7. Report your results: results statements / plots

Section 1

Part 1

The figures below are taken from a study looking at the impact of shade on coffee production in plantations on Mt Kilimanjaro, Tanzania. The researchers postulate that shade influences the microclimate and also the biodiversity within plantations and will cause positive shifts in ecosystem services. It is assumed that coffee grown in the presence on shade trees will have multiple benefits compared to traditional sun grown coffee. Explore these statistical outputs from the coffee study by answering each question.

a) For each figure write a sentence, suitable for a results section, that describes the contents of the figure. [2 marks]

b) Using the model statistics in Fig 1, calculate what the crop yield would be when the canopy index is 10.57, give your answer to two decimal places. [1 mark]

c) Briefly state the confidence you would place in the relationships in the figures below and why you think that this is the case. [2 marks]

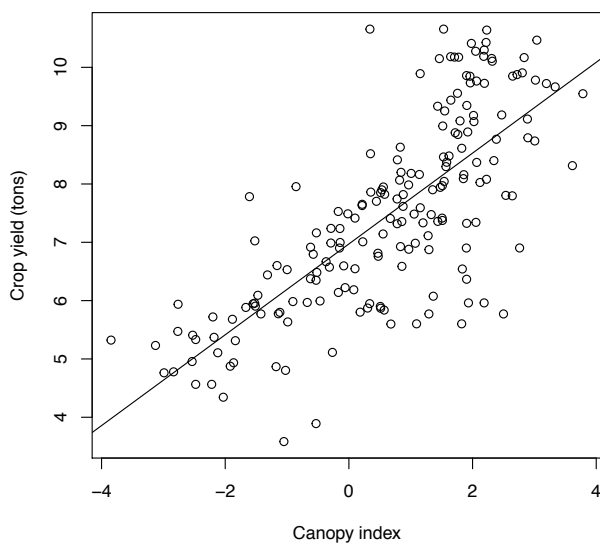


Fig 1. Crop yield against canopy index (a measure of both diversity of shade trees and the amount of shade). Model statistics $R^2 = 0.58$, $p < 0.001$, $n = 164$; intercept = 6.96399 slope = 0.76280.

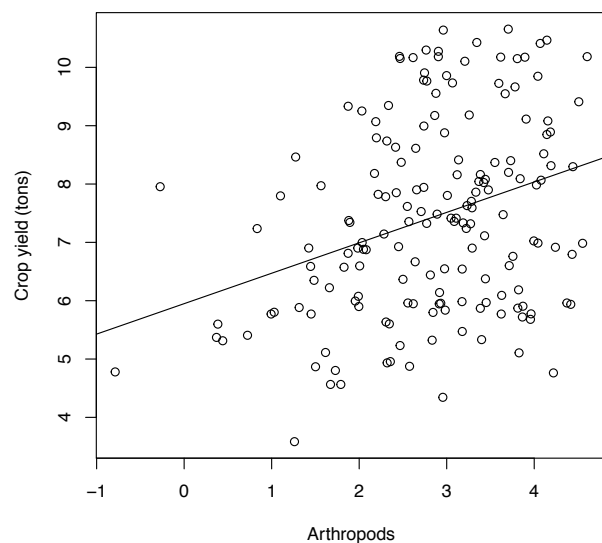


Fig 2. Crop yield against the diversity of predatory arthropods sampled in sun and shade grown coffee plantations. Model statistics $R^2 = 0.07$, $p < 0.001$, $n = 164$; intercept = 6.1383 slope = 0.4509.

Part 2

Below is the output from R of a model investigating the effects of canopy cover on coffee yield.

The model variables are:

crop.yield – the total amount of yield per coffee plot

canopy.index – a composite measure of the amount and diversity of shade trees making up the shade cover

arthropods – the diversity of predatory arthropods (biological defence against invertebrate pests)

aridity – a measure of soil dryness

microbes – the diversity of soil microbes (indication of soil activity and turnover)

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Call:
lm(formula = crop.yield ~ canopy.index + arthropods + aridity +
    microbes, data = coffee)

Residuals:
    Min       1Q   Median       3Q      Max
-2.1930 -0.5375  0.1210  0.5331  2.8608

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  8.9321847  0.4733174  18.871  < 2e-16 ***
canopy.index  0.3162145  0.0638410   4.953  1.85e-06 ***
arthropods    0.2104801  0.0698359   3.014   0.003 **
aridity       -0.8238814  0.0946952  -8.700  3.95e-15 ***
microbes      0.0009922  0.0259840   0.038   0.970
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8481 on 159 degrees of freedom
(44 observations deleted due to missingness)
Multiple R-squared:  0.7332,    Adjusted R-squared:  0.7264
F-statistic: 109.2 on 4 and 159 DF,  p-value: < 2.2e-16
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- Write a sentence suitable for a results section that describes the findings of this model. [3 marks]
- What would you do next if you got this output? Describe the procedures you would carry out next [2 marks]