

Potato and Wheat Yields from Fertilised and Unfertilised Fields

Name/Date

Introduction

A group of farmers is interested in whether a specific fertiliser will increase their annual yield of potatoes and wheat. The fertiliser under investigation is applied to the potato crops grown in a total of 130 different fields, whilst 80 fields growing potatoes are left unfertilised. Similarly, the fertiliser is applied in 90 different fields growing wheat, and 120 other wheat fields are left unfertilised. The yield (in tonnes) of the crop grown in each field is measured and reported.

This analysis investigates whether:

1. There is a difference between the mean yields of potatoes from fields that were fertilised and from fields that were left unfertilised.
2. There is a difference between the mean yields of wheat from fields that were fertilised and from fields that were left unfertilised.

Exploratory Analysis

The sample mean potato and wheat yields from fertilised and unfertilised fields are given in Table 1. The sample mean yield of potatoes from fertilised fields is slightly greater than the sample mean yield from unfertilised fields, but both means seem to be approximately equal here. The sample mean yield of wheat from fertilised fields is greater than the sample mean yield of wheat from unfertilised fields.

Table 1: Sample mean yield of potato and wheat yields (in tonnes) from fields which were fertilised and from fields which were unfertilised.

	Fertilised	Unfertilised
Potato	38.75	38.60
Wheat	23.80	17.98

Histograms of the potato yields from fertilised and unfertilised fields are shown in Figure 1. These suggest that the mean yield of potatoes is approximately equal in fertilised and unfertilised fields and that the standard deviation in these yields is also approximately equal in both fertilised and unfertilised fields.

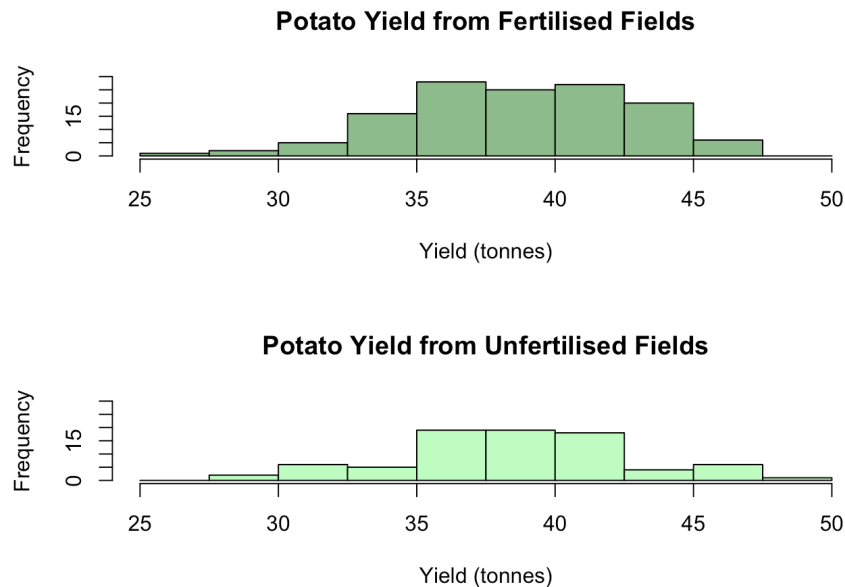


Figure 1: Histograms of potato yields (in tonnes) from fields which are fertilised and fields which are unfertilised.

QQ-plots of the potato yields from all fertilised and unfertilised fields are shown in Figure 2. These suggest that both sets of yields approximately follow a normal distribution.

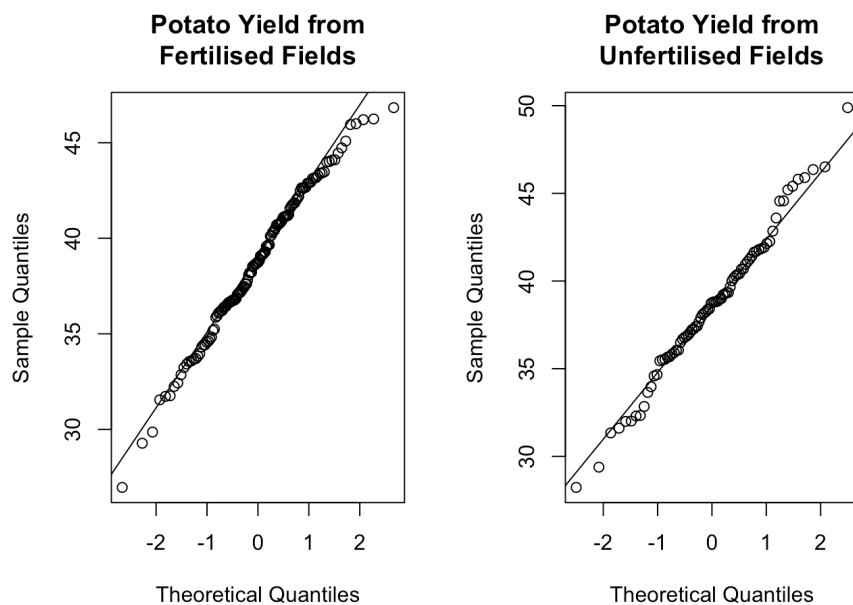


Figure 2: QQ-plots of potato yields (in tonnes) from fields which are fertilised and fields which are unfertilised.

Histograms of the wheat yields from fertilised and unfertilised fields are shown in Figure 3. These suggest that the mean yield of wheat from fertilised fields is greater than the mean yield of wheat from unfertilised fields. The sample standard deviation of wheat yields from fertilised fields seems to be greater than the sample standard deviation of wheat yields from unfertilised fields.

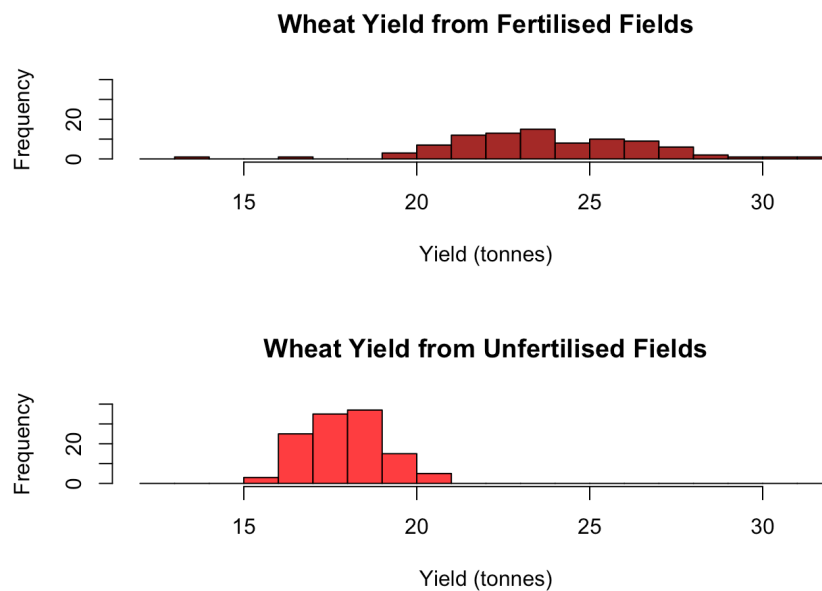


Figure 3: Histograms of wheat yields (in tonnes) from fields which are fertilised and fields which are unfertilised.

QQ-plots of the wheat yields from all fertilised and unfertilised fields are shown in Figure 4. These suggest that both sets of yields approximately follow a normal distribution.

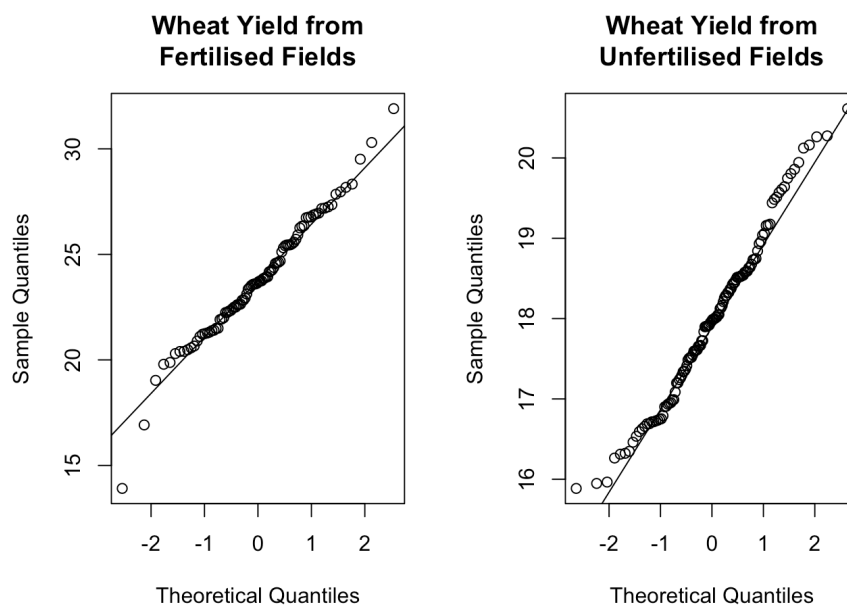


Figure 4: QQ-plots of wheat yields (in tonnes) from fields which are fertilised and fields which are unfertilised.

Statistical Analysis

Describe the statistical methods and techniques used to analyse the data and detail any assumptions made.

Include any relevant output from the analysis completed (do not include R code used to generate the output) and interpret it in the context of the problem.

Conclusion

Provide an answer to the aims of the analysis. Discuss how the formal conclusion compares to the initial impressions from the Exploratory Analysis.

Discuss any limitations in your analysis.