Designing an agricultural field trial

The research farm at Rothamsted, Hertfordshire, UK.
agricultural field trials are conducted to compare the yields of different varieties of crop-plants under realistic conditions.

experimental units are contiguous plots of land, typically long, narrow strips within a square or rectangular field.

design questions include:
- how to orient the strips (e.g., North-South or East-West)?
- which treatments to apply to which strips?
Example

- compare yields of four varieties of wheat

- experiment to be run on a 100 metre by 100 metre square field.

- experimental units are 100 metre by 5 metre strips, hence 20 units in all.

- there is a suspected North-South fertility gradient over the field.
Two possible layouts of the experiment

North

South
Points for discussion

- What precisely might we mean by compare the yields of four varieties of wheat?

- Would you prefer to have the strips running North-South or East-West?

- How would you allocate varieties, A, B, C, D say, amongst the 20 strips?

- How might you alter your design if the precise objective was to find which varieties give the largest yields:
  - on fertile ground?
  - and on infertile ground?