

The impact of agricultural science 1850-2016:

from a gentleman's amusement to
the saviour of the world?

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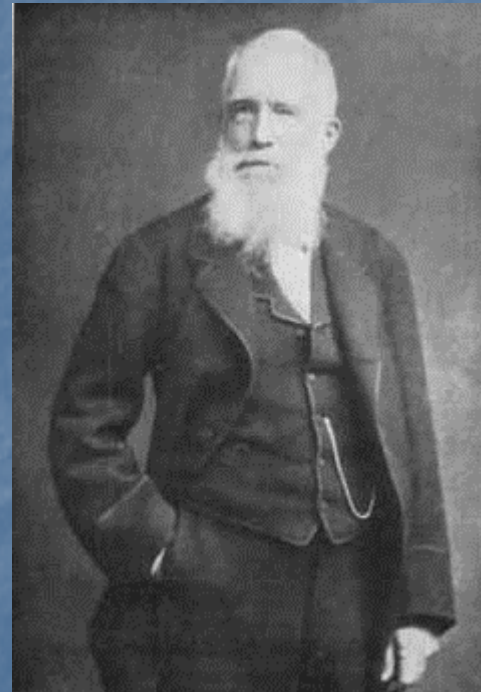
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19th century gentlemen?

Albrecht Daniel Thaer



John Bennet Lawes



The saviour of the world?

- Climate change
- Feeding 9 billion sustainably

What is agricultural science?

- Applied botany, zoology, chemistry, physics, genetics.....?
- Experimental husbandry?
- Explanation or prescription?

How did agricultural science change in the 19th century?

■ JRASE 1878

- Arterial drainage
- On bat's guano
- Exmoor reclamation
- Early fattening of cattle
- Pleuro-pneumonia
- Woburn experiments

■ J.Agric. Sci. 1905

- Mendel & wheat breeding
- Hop pollination
- N assimilation in legume root nodules
- Swede chemistry
- Manure chemistry
- Pasture improvement

And in the 20th and 21st centuries?

- *J.Agric.Sci. 28 (1938)*
- Mostly UK authors
- 2-3 authors/article
- On temperate agric
 - Colostrum vitamin A
 - Clover sickness
 - Latin square experiments
 - Fertiliser timing
- *J.Agric.Sci. 154, 2016*
- Mostly non-UK authors, >3 per article
- On non-temperate crops
 - Genetics
 - Growth analysis
 - Greenhouse gases

How can we assess the impact of agricultural science?

- **Effects** on output or productivity
- Discoveries or useful **explanations** of agricultural problems
- Peer review
- Development of professional **institutions**

Institutional development was the most significant 19th-century change

- Gentlemen became employers
 - Crusius, Lawes
- The rise of the professionals
 - Liebig, Gilbert
- Expansion of research organisations

Grantham's model: agricultural research expands with

- A scientifically-literate bureaucracy
- Cheap and plentiful scientists
- Farm organisations favouring research
- State funding
- New generation of scientists trained by existing practitioners

The effects of increased research in the 20th century

- Breeding
- Fertilisers
- Pesticides
- Feeds
- Animal health
- Mechanisation
- Mendel → GM
- Increased use → precision
- Effectiveness + selectivity
- Increased use → precision
- Increased effectiveness
- Motorisation → control

Measuring success?

- Feeding more people – world population changes
 - 1850 1.2 billion
 - 1950 2.5 billion
 - 2015 7.3 billion

Measuring success?

| | World 1970 | World 2012 | UK 1965-9 | UK 2014 |
|----------------------------|------------|------------|-----------|---------|
| Wheat (tonnes/ha) | 1.5 | 3.1 | 3.9 | 8.6 |
| Barley (tonnes / ha) | 1.7 | 2.7 | 3.6 | 6.4 |
| Potatoes (tonnes / ha) | 13.3 | 18.9 | 24.9 | 47.0 |
| Soyabeans (tonnes / ha) | 1.3 | 2.3 | - | - |
| Milk (litres / cow) | - | - | 3686 | 7897 |

Assessing failure?

Effects

- Breeding
- Fertilisers
- Pesticides
- Feeds
- Animal health
- Mechanisation

Problems?

- GMOs
- Eutrophication
- By-catch
- ?
- Antibiotics
- Energy costs

The Problems of Agricultural Science

- Can it deal with complexity?
- What makes it persuasive?
 - Authority
 - Discourse
 - Media

Conclusions

- World problems need agricultural science
 - Climate change
 - Increasing average yields
 - Feeding 9 billion people
- We need a history of agricultural science