Agriculture and the low-C economy

IAgrE Landwards Conference, Rothamsted: 11 Oct 2017

John Deere SESAM prototype

- 174hp continuous power
- 4-hour run time between charges
- 6R Series tractor chassis

Dr Jonathan Scurlock: Chief Adviser, Renewable Energy and Climate Change,
National Farmers Union of England and Wales

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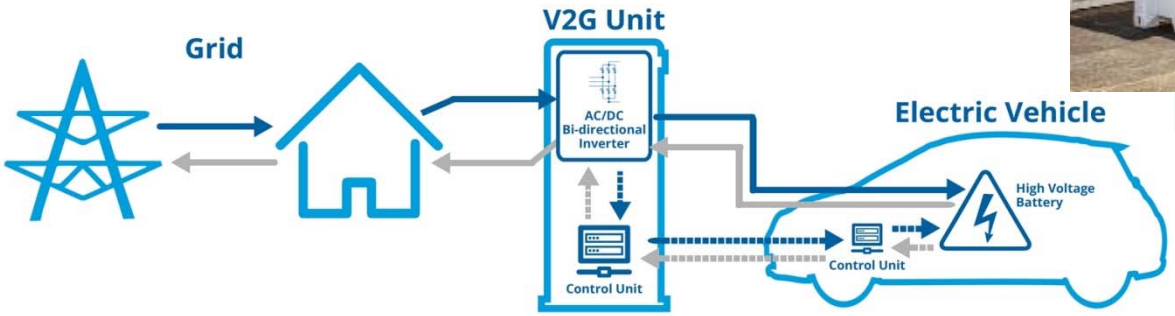
Decarbonising UK agriculture

- Greenhouse gas emissions from agricultural production ~10% of UK total, half of this as N2O from soils, one-third of this as CH4. Direct energy use a modest source, soils/trees a modest sink ("Grazed and Confused")
- But agriculture, within wider Food and Farming industry, is an essential part of a competitive low-carbon British economy post-Brexit

New technologies such as battery storage and vehicle-to-grid can enhance renewable self-generation, enabling farmers to help decarbonise other sectors of the UK economy



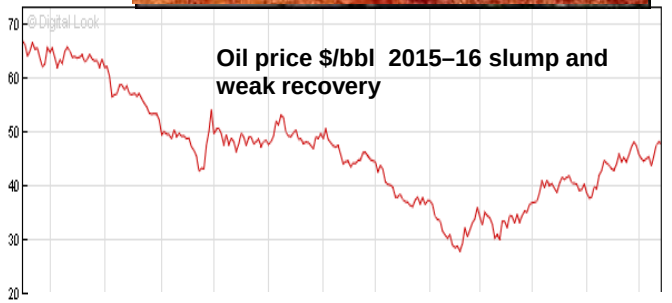
Climate change & energy – NFU policy

- The National Farmers' Union of England and Wales (NFU) represents 55,000 members in commercial agriculture, horticulture and farmer controlled businesses
- climate change, energy security and food security converge to provide an opportunity, not a threat to British agriculture
- Substantial land-based energy resources offer new markets – regardless of Brexit, an important element of domestic agricultural policy
- **More than one in 3 farmers** already diversifying into renewables
- Farmers own or host ~70% of UK solar power, half of AD capacity and the majority of wind power, while playing a significant role in the supply or fuelling of renewable heat
- >1250 solar farms / ~18,000 PV roofs / 277 biogas plants / >4000 heating installations / >2600 medium wind turbines
- but agricultural (non-ETS) emissions are hard to cut deeply (CH4, N2O)

Policy drivers and risk multipliers

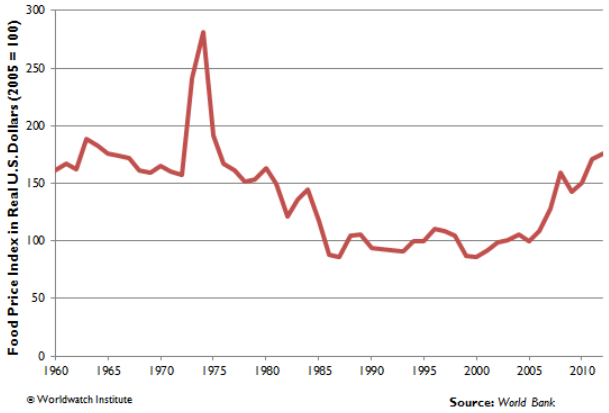
- **climate change** – Obama, Xi, Modi, Fabius: 2015 Paris Agreement (Trump!!); IMF boss and Bank of England governor warnings: global weather disruption towards 2020 and 2050, with agriculture in 'front line'

- **oil price** volatility and energy security: from $147/bbl in 2008 to a low of $30 [now $50-55] McKinsey: peak demand 2030, not 'peak oil'?



- **food security** – end to long-term decline in producer prices, but still volatile. Globalisation; new non-food markets (bioenergy/bioeconomy)

Figure 1. | **World Food Prices, 1960–2012**



- 'Perfect storm' of climate change, energy and food security, converging to drive policy:
  – a threat (increasing input costs and red tape)
  – or an opportunity? (self sufficiency, diversity)

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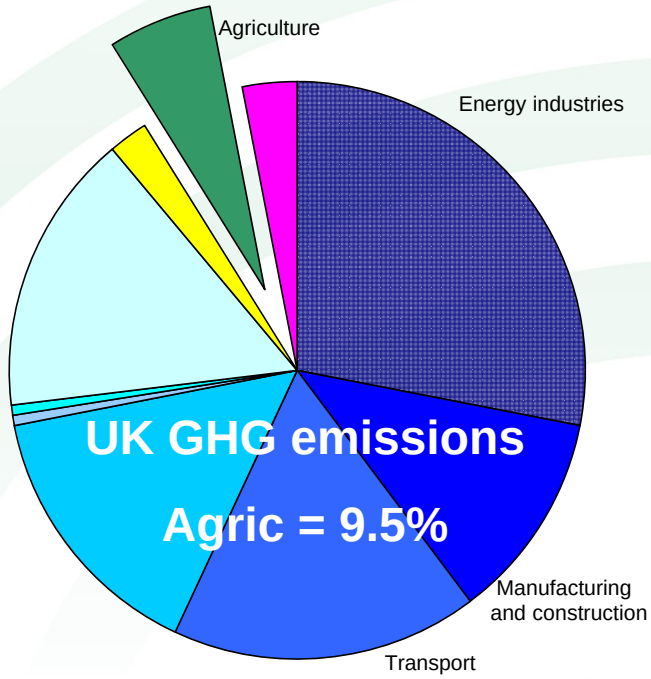
Agriculture Industry partners

14 including all AHDB (Defra has observer status)

Committed to reduce GHG emissions in England by
3 million tonnes of CO_2 equivalent per year by 2018-2022

Voluntary action to tackle climate change emissions from agriculture: but limited progress in C footprinting



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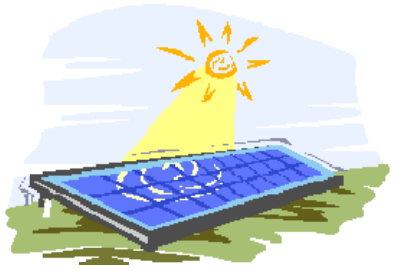

Renewable energy facts

- Wind power capacity worldwide at end 2016 (~500 GW) nearly 50% more than world nuclear capacity (about 330-370 GW): world solar PV >300 GW and doubling every 3 years (e.g. 450 GW by end 2018)
- Solar electricity now the cheapest worldwide (Saudi Arabia ~US¢1.75/kWh) and likely to succeed petroleum as world's main energy commodity by 2040. Solar PV meets >7% of electricity needs in Italy, Germany and Greece
- Bioenergy already the 4th largest form of primary energy after coal, oil and natural gas – and provides 2% of world electricity
- Renewables met ~30% of UK power needs in April-June 2017. Last year, bioenergy provided around 9% of British electricity, wind about 12%, solar 3% and hydro about 1.5% at present – but coal just 9% in 2016!

Innovation required for low-C agriculture

Domestic agricultural policy must support innovation to drive productivity and competitiveness – Industrial Strategy

New technologies

- robotics, drones, data-driven systems, autonomous vehicles, electric/hybrid agricultural machinery and implements, battery electricity storage, advanced agri-renewables (e.g. novel AD), advanced genetics, pest and disease management, biotech and bioeconomy, insect protein feed

Supporting infrastructure required

- more flexible electricity and gas network, heat networks, improved rural internet connections (broadband/mobile phone), more water reservoirs, ‘smart’ farm buildings

Important themes for UK agriculture

- Competition for land use / multi-functional land use
- Entrepreneurial ‘early-adopter’ farmers / knowledge exchange with wider farming community / a few farmers very resistant to change
- Future energy systems likely to be dominated by solar / wind / electricity storage / bioenergy with carbon capture – how will these technologies impact agriculture?
- Agricultural production likely to dominate national GHG emissions in future (25%, 50%) – we can’t just export the problem, but can we earn carbon offsets from renewables?

A cascade of solar farm examples

Electricity storage: a new kid on the block

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Farm technology of the near future?

- Diesel-electric hybrid tractors, forklifts and telehandlers could participate in ‘vehicle-to-grid’ network balancing services
- Based in machinery sheds with solar + storage batteries, earning income towards their charging and maintenance costs

The low-carbon future is now!

Fendt e100 vario electric tractor
100 kWh battery – V2G ready
on sale 2018 in Germany

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