

The UK as a global hub of Agricultural Innovation

OXFORD FARMING CONFERENCE
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The UK as a global hub of Agricultural Technology and Innovation

- The changing world of modern agriculture
- The UK Agri-Tech Industrial Strategy
- UK Farming: a glimpse into the future.....

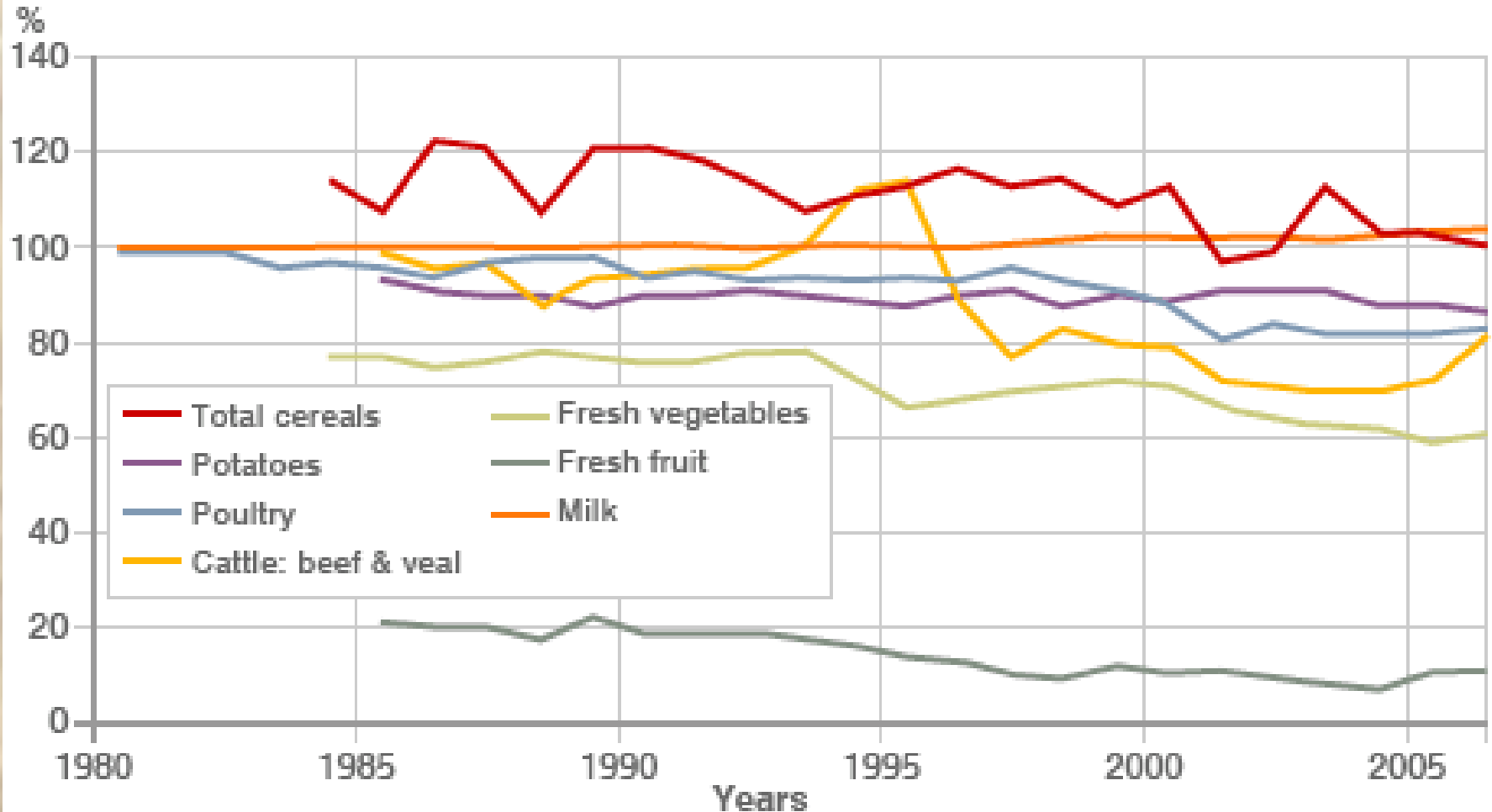
UK Agriculture Sector: a major industry

- The Agri-Food supply chain contributes **£96 billion**
- Agriculture contributes £9 billion to the UK economy
- Underpins **£26 billion food and drink manufacturing sector**
- The UK is one of the top 12 food and drink exporters in the world
- UK **exported £18 billion of food, feed, and drink** in 2012
- **3.8 million employed** in agriculture and fishing supply chains



But UK self sufficiency is *declining*

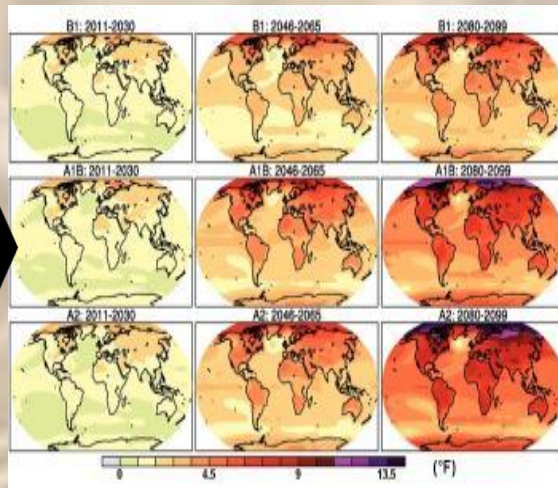
UK food self-sufficiency (by commodity) 1980-2005



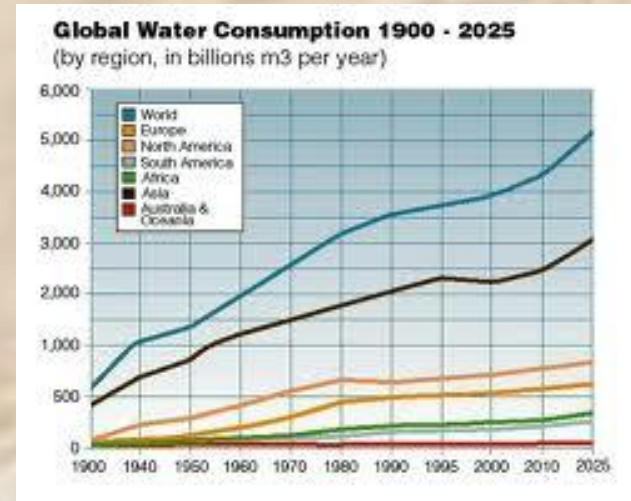
SOURCE: Cabinet Office Strategy Unit (2008)

...big global pressures on all commodities

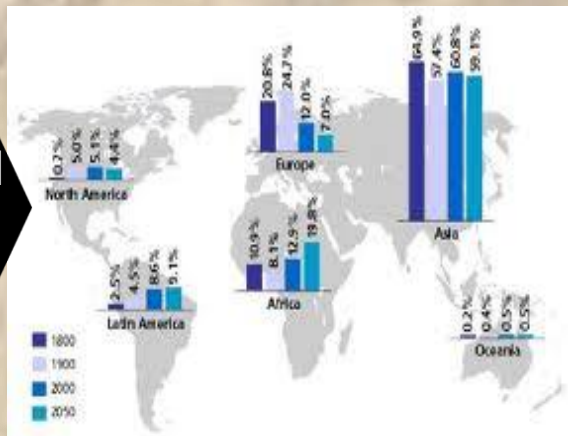
CLIMATE CHANGE



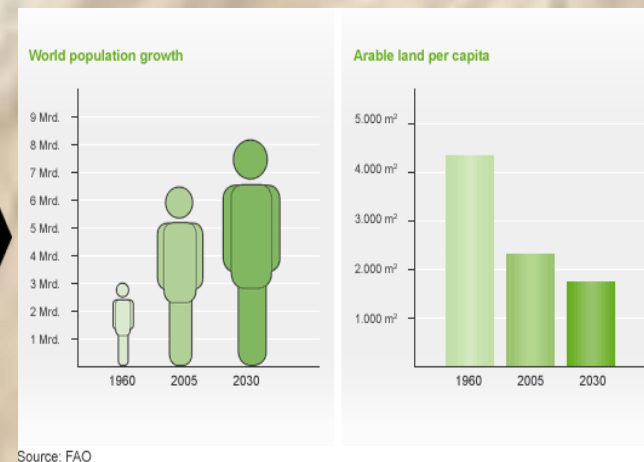
WATER



POPULATION GROWTH



LAND



Source: FAO

Food insecurity. Geo-political tensions.

2012 GLOBAL HUNGER INDEX BY SEVERITY

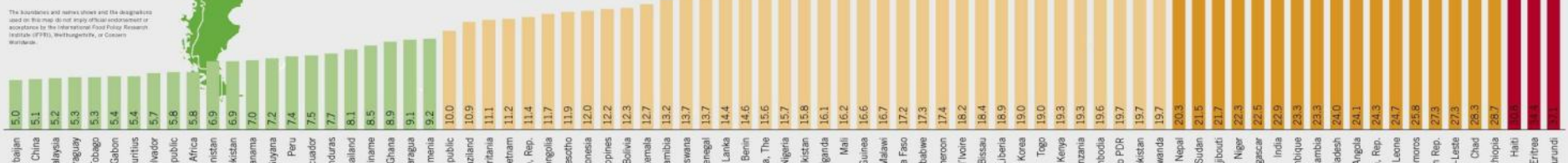


- ≥ 30.0 Extremely alarming
- 20.0–29.9 Alarming
- 10.0–19.9 Serious
- 5.0–9.9 Moderate
- ≤ 4.9 Low
- No data
- Industrialized country



Note: For the 2012 GHI, data on the proportion of under-nourished are for 2005–10 for which data on child underweight for the latest year 2005–10 for which available, and data on mortality are for 2005–10 for which scores were not available for countries for which data were not available and countries with very small populations.

20 countries have *alarming* or *extremely alarming* levels of hunger



The boundaries and names shown and the designations used on this map do not imply endorsement or acceptance by the International Food Policy Research Institute (IFPRI), Washington, or Concern Worldwide.

How are we going to feed the world?



With Technological Innovation




UK – opportunity and challenge

- Home of the 1st Agricultural Revolution
- World class food and farming sector
- World class Agricultural R+D research base
 - (£450m Annual expenditure by UK Govnmnt!)
- Vast global markets for food, R+D + UK leadership

But


- UK Science base + Farming Ind + Global markets not well integrated
- No UK strategy, vision or business plan.

UK Strategy for Agricultural Technologies




 HM Government

Industrial Strategy: government and industry in partnership




A UK Strategy for Agricultural Technologies

July 2013




 HM Government


Agricultural technologies




 Agriculture employs 450,000 people.



 Agriculture contributes **£9 billion** to the UK economy and underpins the UK's **£26 billion** food and drink manufacturing sector.



 A pest management system developed by British and Kenyan scientists has increased yield in parts of Kenya **by up to 100%**.



 The growing global agricultural technologies sector is worth **\$400 billion**, offering export opportunities in emerging markets.

#indstrategy

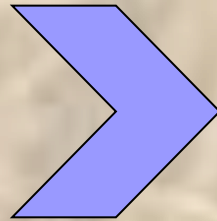
Science + Innovation



Science

Supply Chain

Global markets



Science



Supply Chain



Global markets



Science

Food and Farming

Aid & Trade

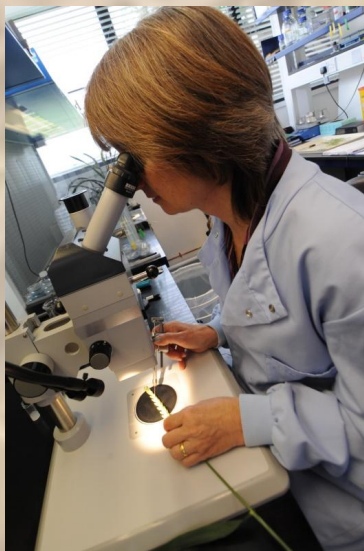


Science

Food and Farming

Aid & Trade

← INWARD INVESTMENT



→ TRADE AND EXPORTS



The Goal: *what success would look like*

- Better industry links / Leadership in UK Ag-Sci
- Significant Inward Co-investment Into UK R+D
 - From Global + Industry / Partners
- Boost Global Status of UK Ag Research
 - Attract and train top rising star researchers
- Better Capture And Commercialise UK IPR
 - Technology transfer / spin outs and start-ups
- Catalyse a vibrant UK Agri-tech VC Sector
- Support greater industry / research collaboration and uptake
- Develop UK leadership in science + metrics of sustainability / Ag-informatics
- New Global Collaborations / Trade Links

A wide range of potential Partners

- UK Research sector
 - JIC, Rothamsted, Aberystwyth, IFR, NIAB, Roslin, James Hutton, Etc
 - Levy Boards
 - BBSRC
- Global AgBioTech
 - Big 6:
 - UK: Syngenta,
 - Row: Basf, Monstanto, Bayer...
 - Nutraceuticals:
 - Abbot Nutrition
 - Unilever
- Farming
 - Progressive Leaders: Cargill, Velcourt, G's, Spearhead, Etc
 - Family Farms
- Food Industry
 - UK And Global. (Pepsico.
 - Small / Farm Gate
 - Processors
 - Retailers
- Charities
 - UK Foundations
 - Gatsby / Hutton Etc
 - Gates Foundation
 - NGOs
- Sovereign Wealth
 - Brics
 - Qatar
 - EU

Measures

1. The Agri-Tech Catalyst Fund
2. Institute of Agricultural Metrics
3. Agricultural Innovation 'Hubs'
4. Access to global markets



1. Agri-Tech Catalyst Fund



- A £70 million Fund to support early stage Proof of Concept / Translation of agricultural innovation
- Strategic aim: to promote innovation and the translation of science and technology into common practice in the supply chain
- The Catalyst will take innovative ideas from any sector or discipline that demonstrate the potential to advance sustainable intensification of agriculture and deliver economic impact for the UK Agri-Tech industry by tackling domestic or international challenges.

Agri-Tech Catalyst Fund – Grant Categories

Early Stage Feasibility Studies

Enables the exploration/evaluation of the commercial potential of an early-stage scientific idea, through:

- Review of research evidence and application potential in agri-food production
- Assessment of business opportunity
- Experimental studies to validate initial concepts
- Scoping for further development

- Duration – up to 12 months
- Maximum grant – up to £250K
- Application can be academic or business-led
- Funding proportion – up to 75% of total eligible project costs for SMEs; 60% for large companies

Industrial Research

To evaluate the technical feasibility of an idea and establish proof of concept, through:

- Experimental evaluation
- Proof-of-concept using plot/field trials
- Exploration of production mechanisms
- Prototyping
- Product development planning and market testing
- Intellectual property protection or widespread dissemination of findings

- Duration – typically 3-5 years
- Maximum grant – up to £3m
- Application must be business-led
- Funding proportion – up to 60% of total eligible project costs for SMEs; 50% for large companies

Late Stage Feasibility Studies

Enables the evaluation of proof of the commercial potential of a scientific application, through:

- Review of commercial value of application in agri-food production
- Proof of business opportunity
- Demonstration studies to validate application
- Intellectual property protection
- Route to market

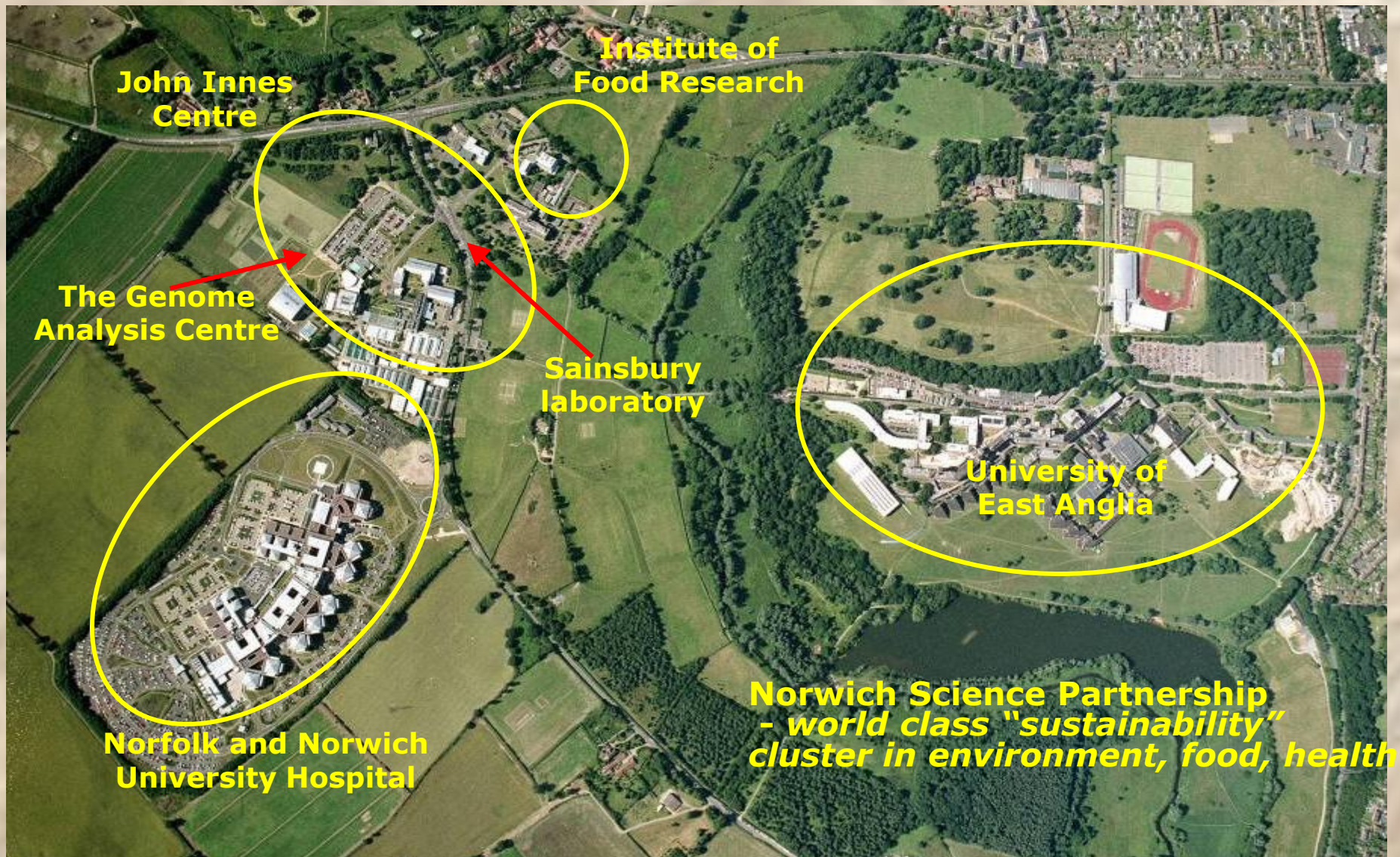
- Duration – up to 12 months
- Maximum grant – up to £250K
- Application must be business-led
- Funding proportion –
Pre Experimental Development - up to 50% of total eligible project costs for SMEs; 40% for large companies
Experimental Development - up to 35% of total eligible project costs for SMEs; 25% for large companies

2. Agricultural Innovation 'hubs'

- Investing £90 million in a number of regional / sectoral Agricultural Innovation 'hubs'
 - Virtual / Physical
 - Sectoral / Regional
 - Deep science to near market
- Network of grassroots Hubs for practical farm businesses / Ag Colleges to plug into
- The first Centre for Agricultural Informatics, to establish the UK as a world class centre in agricultural informatics
- Rest will be industry-led / partnered
- Open to bids now



Investing in regional clusters



3. Institute of Agricultural Metrics

- Informatics is the collation and application of insights gained from the study of large integrated data sets
- It is starting to deliver benefits across genetics, economics, agronomy, hydrology and soil science.
- The Government will establish a Centre for Agricultural Informatics and Metrics of Sustainability, at an estimated cost of £10 million.
- Creating a global hub of excellence.
- The first of the Centres of Agricultural Innovation.



Big Data – Private Sources

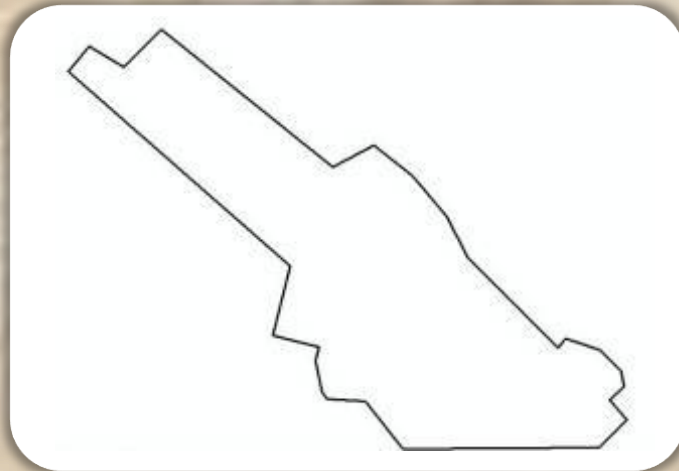
Objective: Analyse Sainsbury's Farm against BioCarbon Tracker data

Brief:

- Kenya
- LAT 0.12090N, LONG 37.05980E
- 120 Ha's
- Green Beans, Garden Peas & Chillies

Plan:

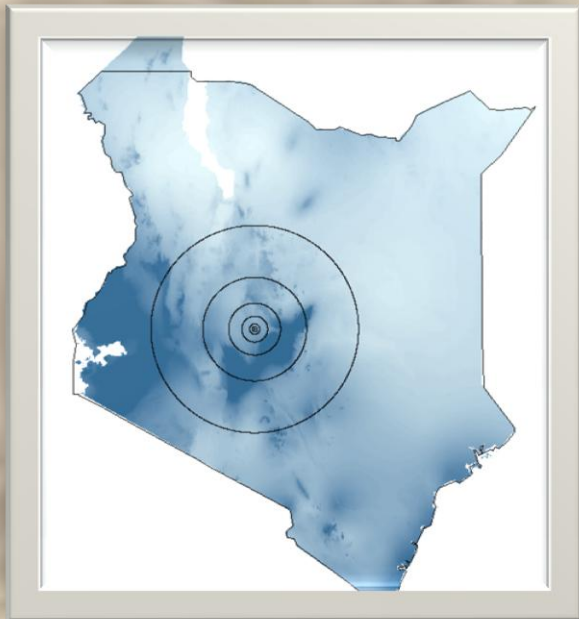
1. Define footprint
2. Define timescale
3. Define sustainability layers
4. Quantify Impact
5. Report Risks



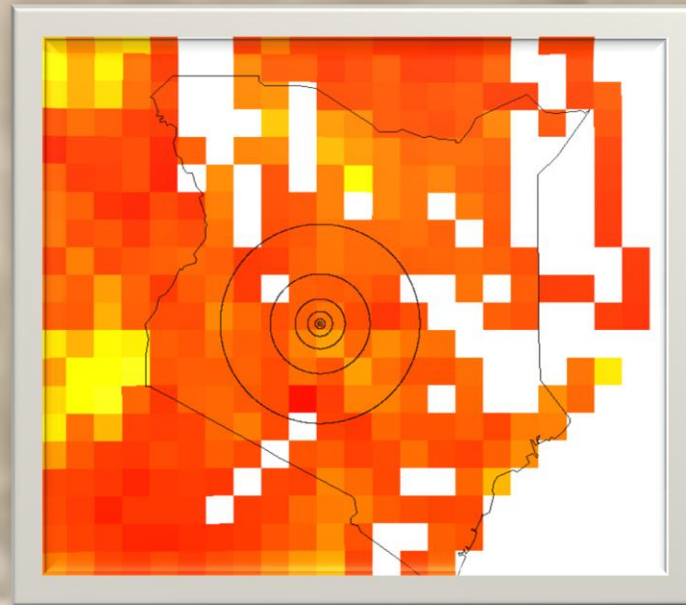
Define footprint

Big Data – Public Sources

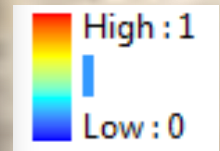
Example: Quantify Water impact and Risk



Average Annual rainfall for Kenya (source: WRI)



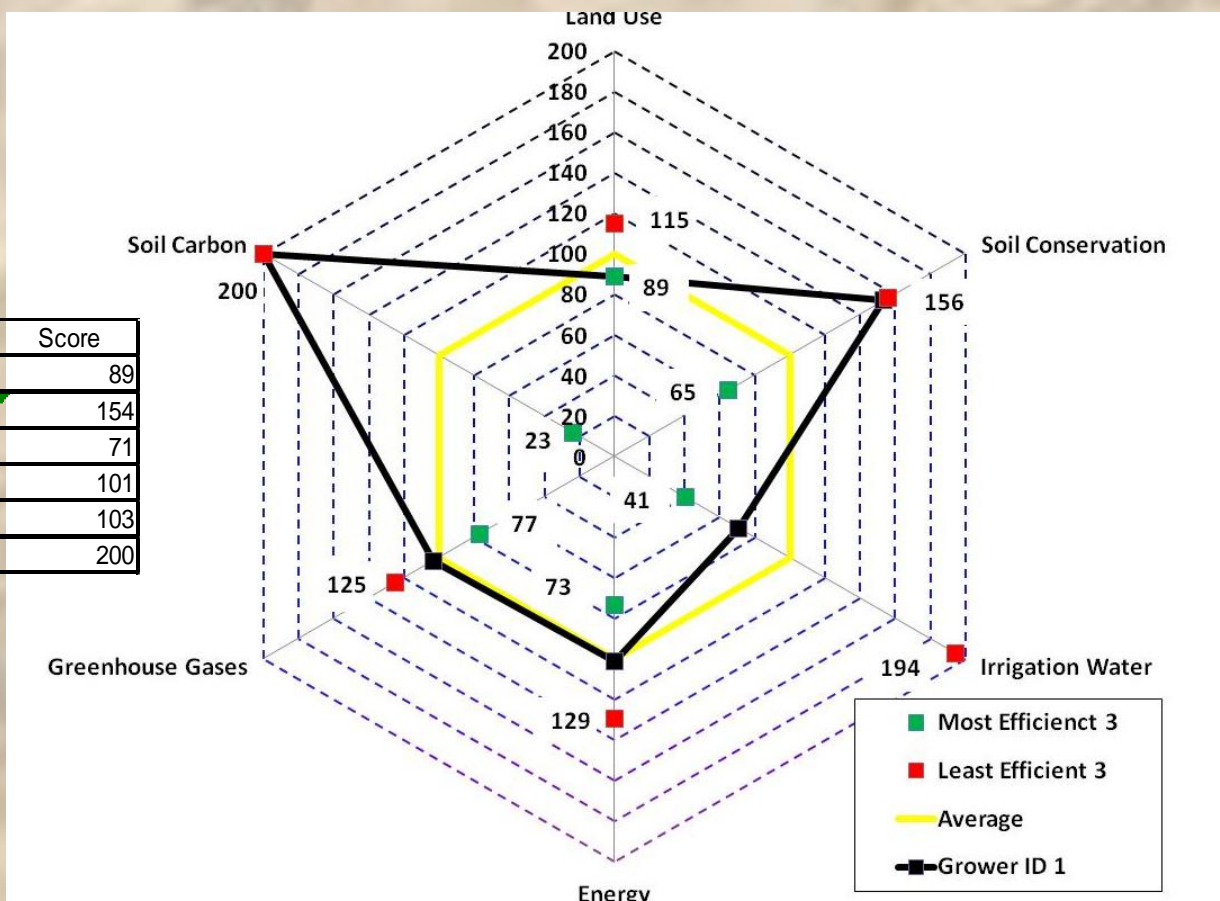
Adjusted Human Water Scarcity Index (source: Riverthreat.net)



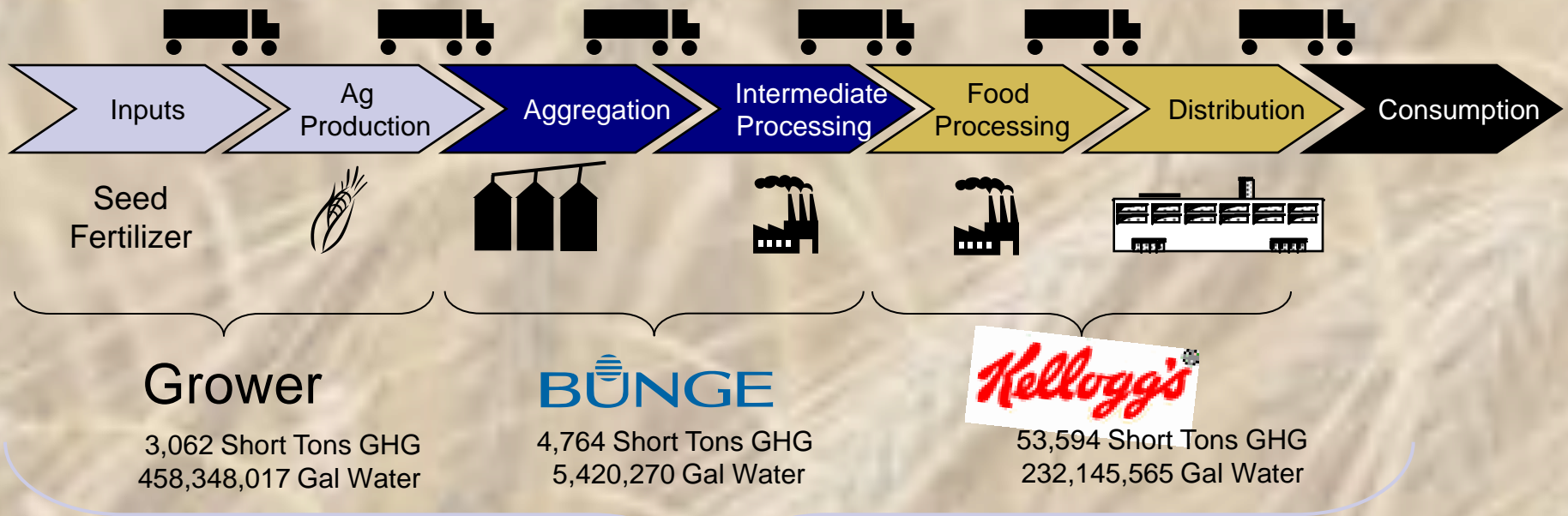
- Water Risk Index shows high risk of human water competition
- Irrigation rates/ Crop Evapotranspiration rates can be compared to Natural Vegetation water demand
- Other Water Risk Indexes & Meteorological data are available to indicate global water risk

Irrigated Corn 2009, Crete Nebraska – Average Field Print and Grower ID No. 1

Grower ID - 1	Score
Land Use	89
Soil Conservation	154
Irrigation Water	71
Energy	101
Greenhouse Gases	103
Soil Carbon	200



Nebraska Food Chain Pilot: Greenhouse Gas Emissions & Water Usage



Total 2009 Greenhouse Gas Emissions = 62,533 Short Tons
Total 2009 Water Usage = 695,913,852 Gal

4. Emerging Markets

DfiD £10m Catalyst for Emerging Market Agri-Tech

FCO / DfiD 'Africa Britain China' (ABC) Partnership

UKTI Agri-Tech Unit
Inward investment
Trade and Export promotion

.....Agri-Tech in the 'Global Race'
.....Strategic alignment of Aid and Trade in emerging mkts
.....eg: Kenya / E Africa



Case Study: Scuba Rice

- Paddy loss due to flooding in Bangladesh and India = c4m tons of rice p/year - enough to feed 30m people
- In the Philippines, 2006, 50 provinces were affected by devastating typhoons and floods which cost the rice industry US\$65m.
- Research led by IRRI has developed a flood-tolerant local rice variety to isolate the gene responsible for flood resistance.
- The flood tolerant “scuba” versions of rice varieties can withstand 17 days of complete water submergence
- Six Sub1 “mega varieties” of rice have been produced

IRRI
INTERNATIONAL RICE RESEARCH INSTITUTE




"I gave up hope of getting any yield from my land as paddy seedlings remained submerged for 17 days. But to my surprise the seedlings grew green again after the flood. Still I can't believe I have got 18 maunds (672 kg) of paddy from there."**Biplob Sarker, farmer, Bangladesh**

So where are we?

Update:





Future of UK Farming.....2050?

The major drivers transforming the world are transforming farming, too.

- *Globalisation*
- *Technological Innovation*
- *Societal change*

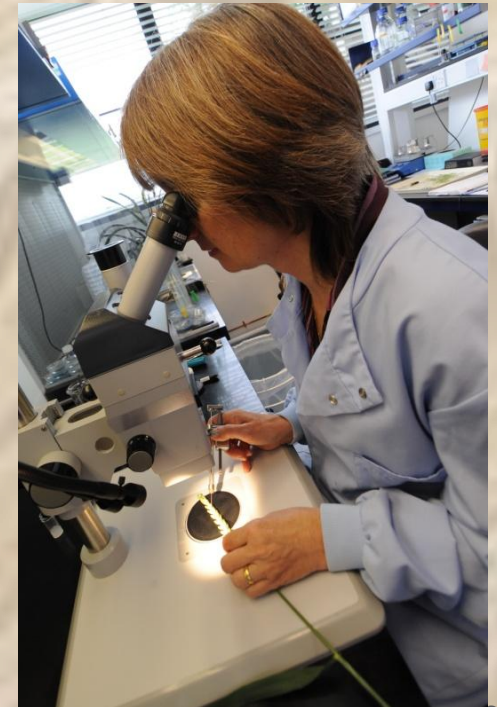
Globalisation

- World economy doubled in size since 2001 (1/3rd from the BRICs)
- Aggregate GDP of the BRICs has almost quadrupled since 2001 (from c \$3trillion to \$12tr)
- GDP increase of BRICs > twice that of the USA. Equiv to the creation of another new Japan+Germany, or five UKs, in 10yrs



Technological change

- In 1972 only 42% of households had a telephone.
- In 2012 100% had access to a phone; 86% of households had access to a mobile.
- In 1985 only 13% of households had a computer.
- In 2011 80% of households had a computer.
- Since June 2012, mySoil app has had more than 2.6 million hits and 12,500 users.



Societal change

- World population set to reach 9.6 billion by 2050
- Population of India set to surpass that of China in 2028
- Global life expectancy set to reach 82 years in 2100.
- Will need to *double* world food production with 50% energy, water and on same land area
- Global explosion of Western diets (and disease)




A glimpse into the future...?

- CAP (Pillar 1 and 2!) gone
- (3) distinct types of 'farmer' in UK
 - Large Intensive 'progressive' crop + food producers
 - Small specialist high niche lifestyle food growers
 - Landscape managers
- Much routine work replaced by robotics / automation
- Total supply chain transparency. (*Everything* measured)
- Precision farming. Total traceability. Onfarm Informatics.
- End of cheap food.
- UK land, labour and input costs continue to spiral.
- Farm labourers with PhDs (+£100k salaries)
- Cost of land. Food factories? Hyrdoponics?

A glimpse into the future.....?

- Every farm a mini-power station
- Global Population c10billion (+25%) with ballooning emerging middle class demand for Western food + diet
- Global Obesity epidemic
- Nutraceuticals and Functional Foods.....Pharma and Agri-Food sectors converge
- NHS prescribes dietary HealthFoods as part of disease prevention....eg. Benneforte Broccoli.....
- Genomic trait technology revolutionises plant breeding
- Organic and Intensive conventional and GM co-existing
- Farming: one of the UK's most dynamic + entrepreneurial sectors of the economy



A period of accelerating change
which will transform.....everything.....

- the business of farming
- skills training for the next generation
- public attitudes to food and agriculture
- agricultural politics and policymaking
- the way farming is viewed by the rest of society



The key to success?

Ambitious, skilled, entrepreneurial next generation of new entrants.



(A new vision (and public and political discourse) of modern dynamic farming.)

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