



**INNOVATION  
IS**

**GREAT**

**BRITAIN**

3/15/2016



# CONTENTS

---

## ABOUT ME

## THE FUTURE WORLD OF FOOD AND FARMING

### Summary of the 'Need'

### Summary of the Opportunity for Agri innovation: Industry Overview

### The UK Government Picture:

What is UK Trade and Investment (UKTI)?

Agricultural Technology Delivery and the Agritech organisation (ATO)



# Agricultural Innovation.. a brain storm

---

Prof Janet Bainbridge OBE  
CEO UKTI Agricultural  
Technology Organisation

Congratulations on the launch of your excellent Foresight report



# About Me

---

- Medical microbiology then career change to Biochemical Engineering
- Invented 'Use by, sell by'
- Long academic career (Publications/Personal Chair/high level leadership)
- UK and EU regulatory Experience
- 1 Year in Brussels - DG Research
- Member of UK Potato Council and R&D Chair & Founder Member of Agriculture and Horticulture Development Board AHDB
- Member of Research Council Board (Engineering and Physical Sciences)
- Extensive consultancy work - including Innovate UK; EU, Universities
- Extensive experience of grant writing , management and delivery of National and EU funding
- CEO of Small business.
- Now advisor to UK Government on agriculture; co-author of UK Agricultural Technology strategy and member of Synthetic Biology Leadership Council
- Role in UKTI to delivery Innovation leading to Trade and Investment benefits as a specialist advisor to July 2016.

•  Innovation & Sparkling Science Ltd



# BUT MOST OF ALL .....

---

**Delivery of Innovation**

**For Commercial success**



# What does the future hold for Agriculture?

---

## Unbelievable Innovation New Technologies

ICT Enabled technology:

Robotics

Big Data

Cloud Computing

Artificial Intelligence

Synthetic Biology

Bioengineering

NanoTechnology and novel materials including Graphene

Epigenetics

Microbiome



# Be warned .....

---

We must be led by Industry 'pull' not research 'push'

Many of the technologies will be disruptive

Need a thorough cost - benefit analysis for each and every application

BUT

We need to take a new approach

A new Industrial Revolution

Disciplines working together



# Industry Overview – still critical for world food security

---

## UK agri-food supply chain

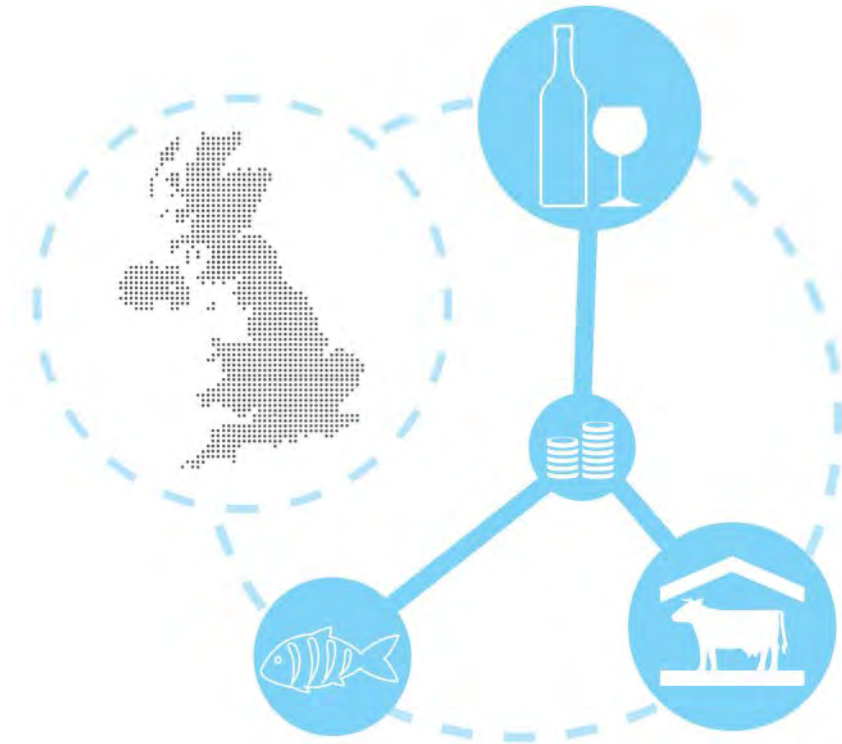
- Agriculture and fishing to final retailing and catering
- Worth £96 billion (7% of GVA)
- Employs 3.8 million people

## UK agriculture

- Employs 450,000
- Contributes £9 billion to economy

## UK exports

- £22 billion of food, feed and drink in 2013
- One of the top 12 food and drink exporters





# Feeding the World - all depends on Innovation

---

## Opportunities for growth

Key sectors are:

- Plant breeding
- Plant nutrition
- Plant health
- Animal breeding
- Animal health
- Agri-engineering
- Animal health
- Agri-engineering
- Sensor technologies for field mapping, disease mapping, yield mapping
- Water management

## Sector Strengths – overview you know yours.....

The UK boasts three specific strengths

- The science base
- The food and farming supply chain
- Access to global markets

The Government's UK Strategy for Agricultural Technologies will ensure these elements work together to enhance the UK's world-leading position



# THE NEED

---

To sustain current population growth agricultural productivity will need to double in the next 30 years

Increasing shortage of good arable land (..... and energy and water )

**Regulatory approvals create cost and time barriers to commercialisation of many potential innovations**

**Agricultural Science has to embrace new technologies , specifically those which can provide essential information distilled into a simple format**



# Know and Build upon your strengths.....

---

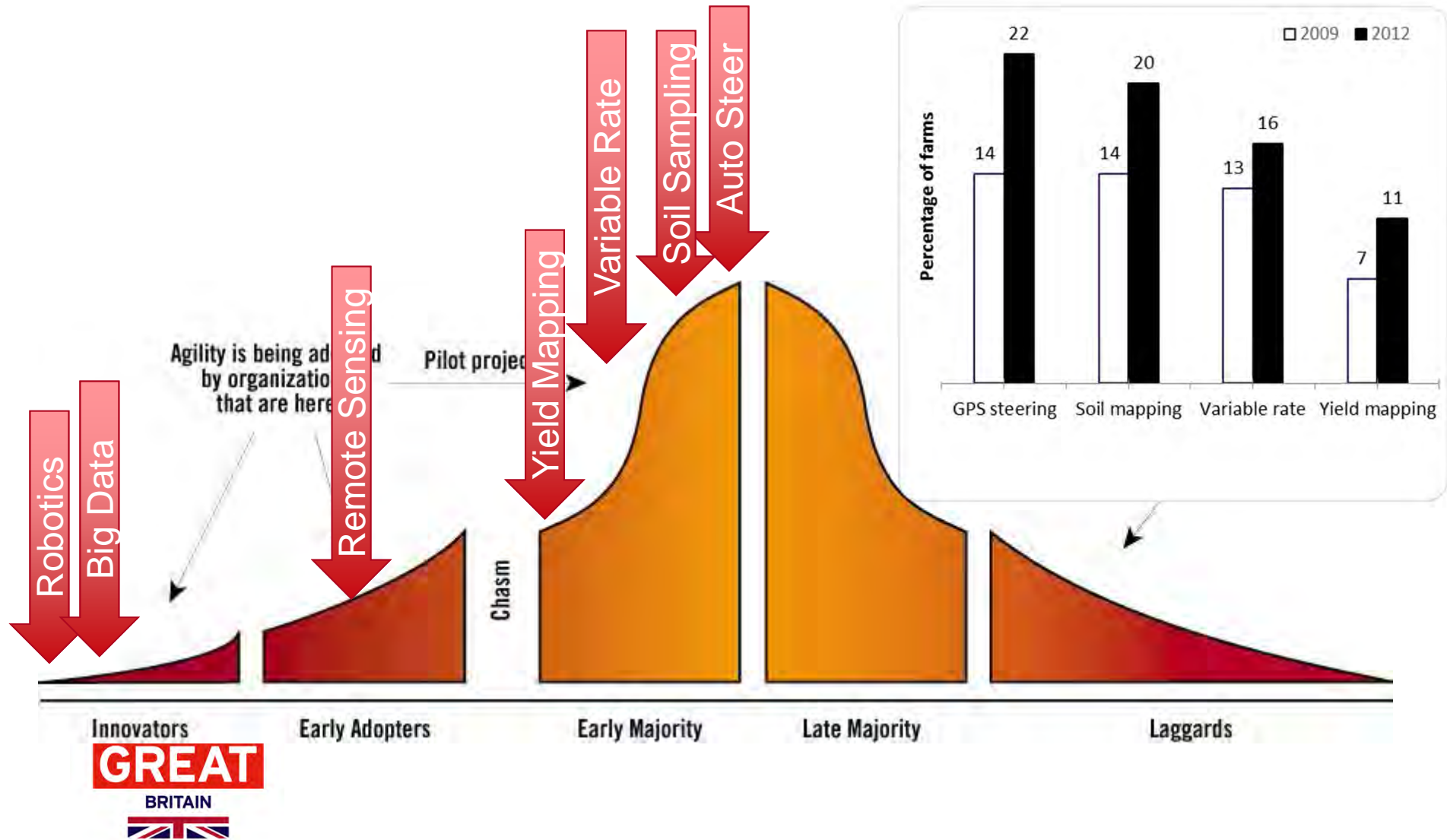
For example:

## Data, Digital Agriculture and Devices

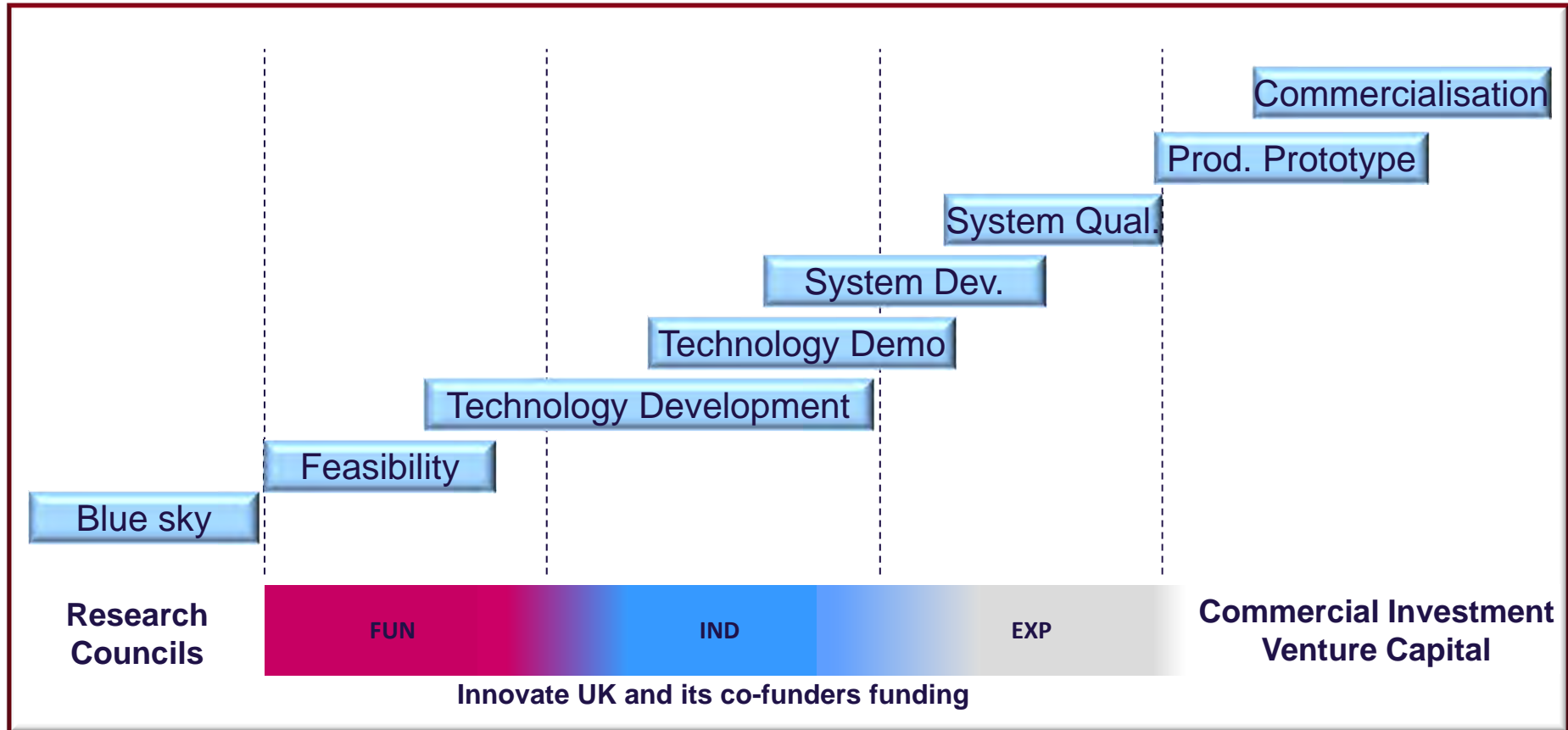
Helping the Agriculture Industry to capitalise on a growing market opportunity on novel technologies



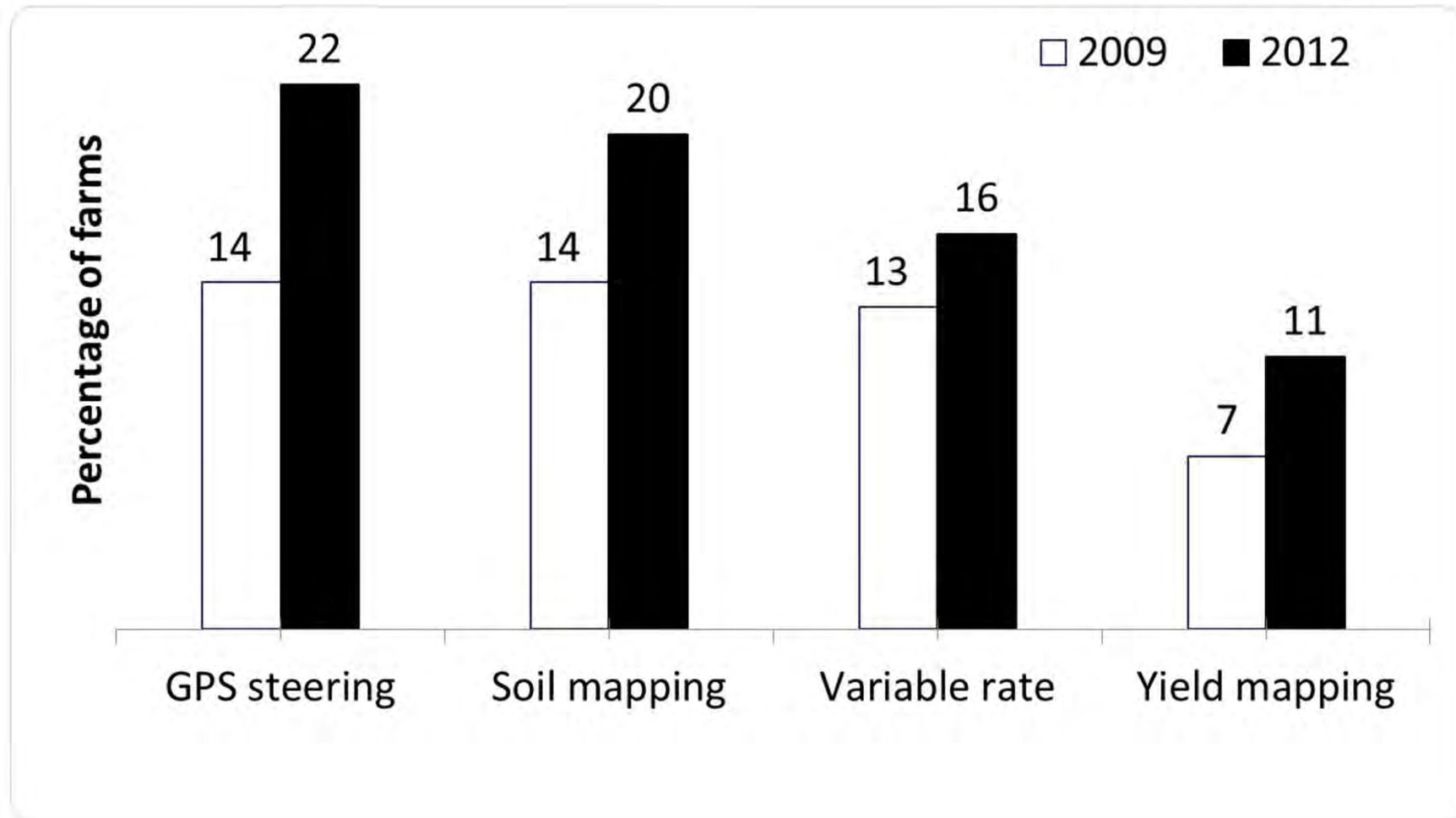
# Technology Uptake



# Types of project



# Current UK adoption of Precision Technologies



# PRECISION AGRICULTURE/ DIGITAL AGRICULTURE

---

Key technologies being adopted by UK farmers include GPS steering systems, robotic milking machines, smartphones, combine yield mapping, GPS soil analysis, variable rate fertilisers, cow heat detection devices, crop sensors, aerial drones, electronic ear tags, farm management software and robotic livestock feeders.



**More than half of UK farmland uses precision agri-tech.**

## Multinational companies with an agri-tech interest in the UK include:

- AgCo
- Agrii
- BASF
- Bayer
- Dow Chemicals
- Frontier
- Isagri
- John Deere
- Lockheed Martin
- Monsanto
- New Holland
- PepsiCo
- Syngenta
- Topcon
- Trimble
- Ursula
- Zoetis

## Farmers and technology

---

- Farmers are not integrators of technology
  - Mapping – Soil – Yield
  - Variable Rate – Post processed – real time
  - Machine control – Auto steer and section control
- Compatibility issues
- Support Issues





# Working Across Boundaries.....

---

**Williams Formula 1 team and  
J Sainsbury Ltd**

**Efficiency of freezers utilising  
aerofoil technology**

**Lockheed Martin Aquaculture**

**Space technology to monitor sea bed  
and relocate fish nets in South  
Pacific**

**Polymer technology Kaneka**

**Introduction of rodenticides into  
trickle- irrigation pipes**



# ROBOTICS ..... a practical example

---

Kyoto Japan      SPREAD Company

**New Lettuce Factory:**

**4800 sq m**

**Fully Automated seedling to harvest**

**50% reduction in labour**

**25% reduction per head lettuce**

**Novel aircon, LED lighting,**

**98% water recycle - the main driver**

**Stable production**

**Transferable anywhere**

**30,000 heads per day/10 million p.a.**

**BUT.....**

**Almost \$17m capex (including R&D)**

**Efficiencies based on sales targets**

**Profits too.....**



# Big Data!!!

---



# Data is often considered a burden and big stick

---



# **THE NEED.....for a joined-up approach**

---

**90% Of all the data in the world was created in the last 2 Years (IBM 2014)**

**Companies that use Big Data are 5 times more likely to make decisions much faster than market peers (Bain and Co)**

**Organisations using advanced data analytics are twice as likely to be sector leaders**



# THE SOLUTION

---

- And the answer to some problems .....digital solutions
  - HIGH TECH SENSORS,
  - CLOUD COMPUTING,
  - SPECIALISED SOFTWARE
  - The INTERNET of THINGS

Are all being integrated into farming and Europe must deliver the answers that farmers need - on a daily basis

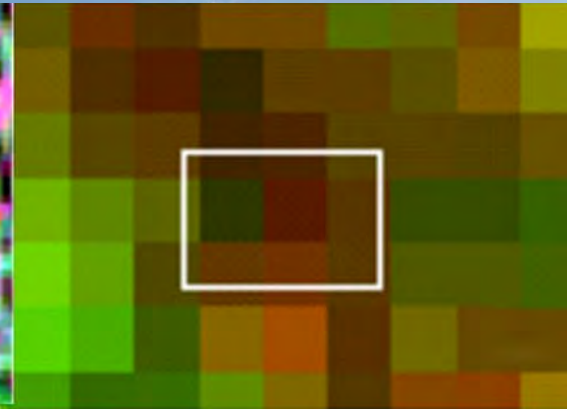
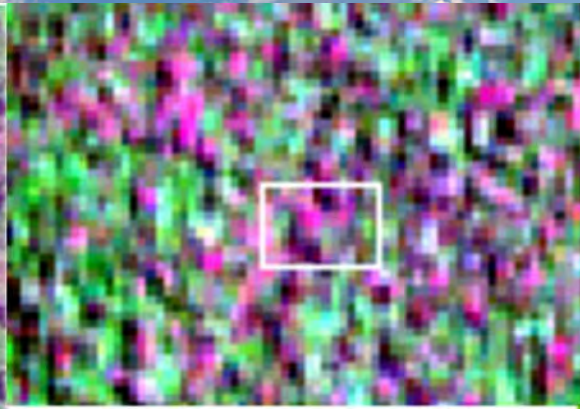


# Changes in data size and resolution

High Resolution  
UAV

High Resolution  
Satellite

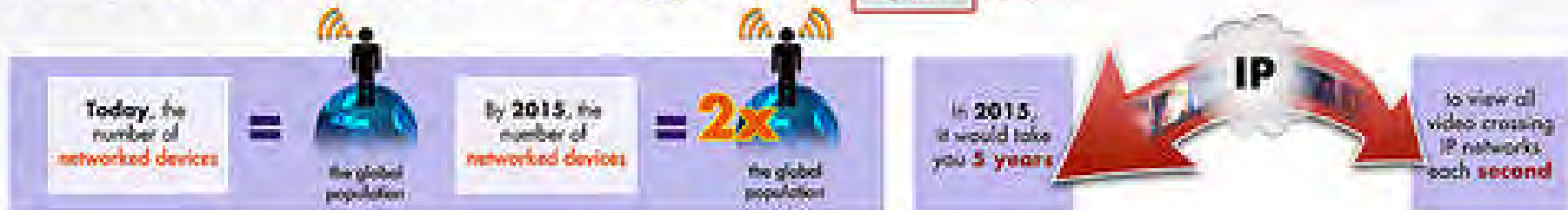
Low Resolution  
Satellite



# What Happens in an Internet Minute?



## And Future Growth is Staggering





# The UK “Space Sector”

Contributes £11.3 billion to the economy

Direct employment  
35,000

Estimated jobs supported by space  
101,000

Three quarters of staff are graduates

85% commercial business

Upstream industry is three times more R&D intensive than the normal UK average

UK space sector average growth rate  
7.5% pa

Estimated UK share of the global market  
7%

Targeting a £40B turnover in 2030

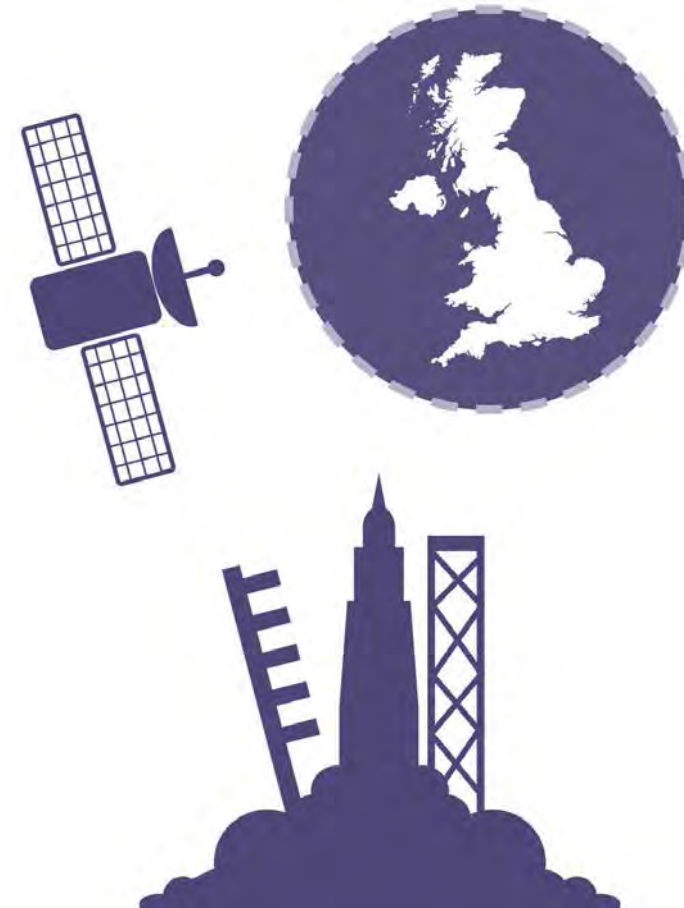


# Investing in Space technologies

---

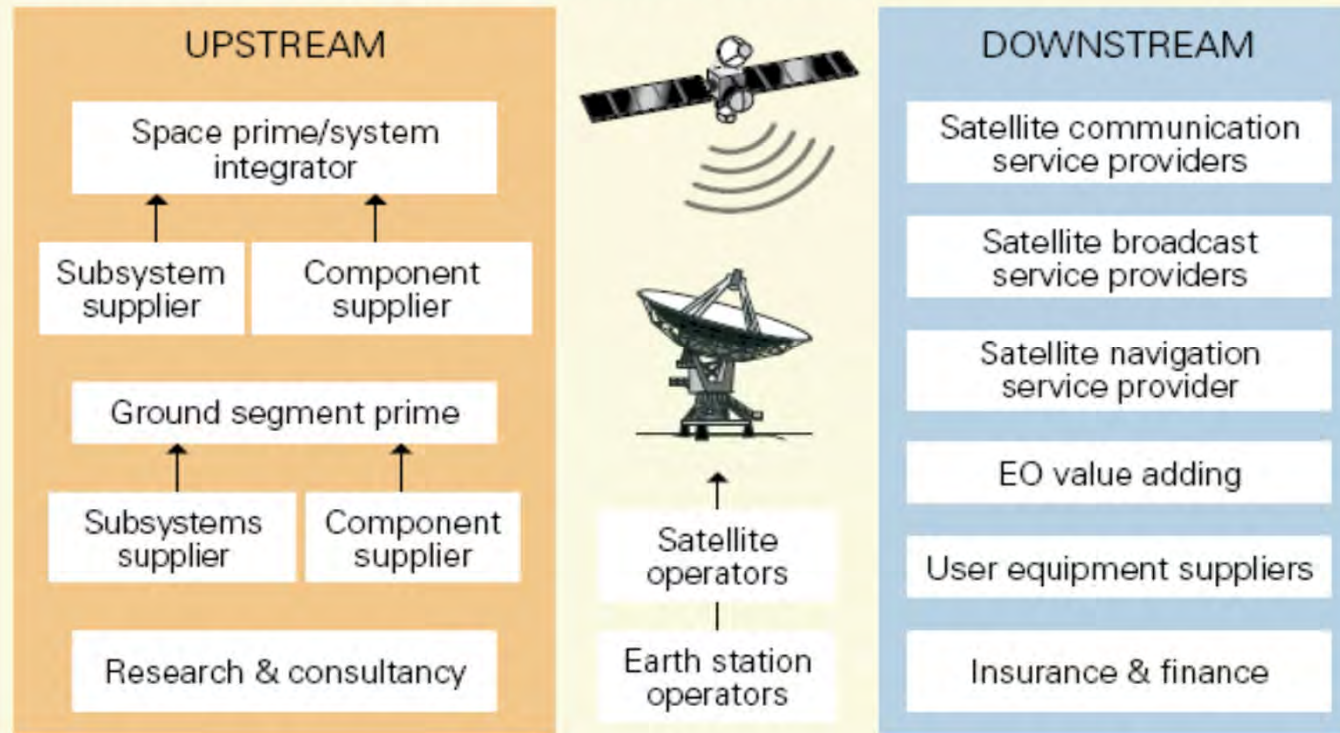
The UK government is very supportive of the Space Industry. Recent examples:

- £130m for development of telecommunications (ARTES)
- £48m to support ExoMars programme
- £2m Innovate UK/UKSA for spacecraft propulsion
- £32m UKSA International Space Partnership Programme



# The UK Space Sector

## Upstream and Downstream market definitions



### Emerging “Newspace” - data enabled markets:

- Smart cities.
- Telemedicine
- Agritech
- Transport
- Mobile comms
- Maritime apps
- M2M
- Ubiquitous broadband.

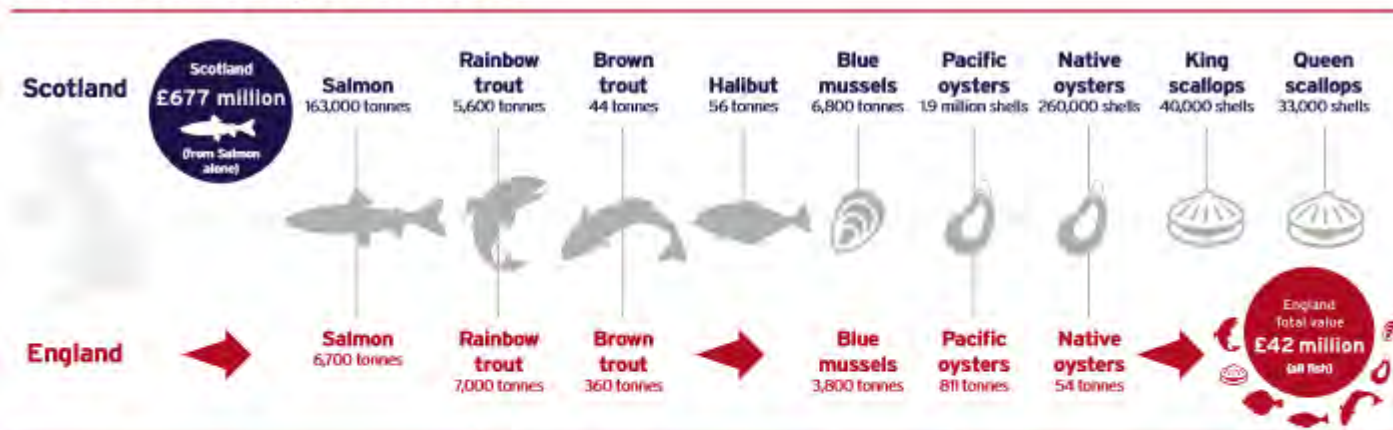


### Emerging entrepreneurial “Newspace”

Horizontal launchers, small launchers, LEO/MEO constellations, Smallsats, Cubesats, Nanosats.

# AQUACULTURE

## Aquaculture production



The UK is the leading aquaculture producer by value, within the European Union



Every new fish farm contributes an average of £10.5 million per annum to the UK economy

The UK has the world's largest algal bio-fuel project (£26 million) to develop transport fuels from algae by 2020

£26m

Fresh salmon is exported to over 50 countries



# UK PLANT SCIENCE ....2

---

- Wheat is the UK's largest export crop
  - 16 million tonnes grown per annum
  - Annual farm gate value of more than £2 billion
  - 2.5-3 million tonnes exported
- World-leading research facilities
  - Can replicate any climatic and culture condition found in the world
- Reading University houses the world collection of cocoa plants
  - As a result, world-leading companies locate chocolate R&D in the UK, including Cadbury-Kraft and Mars
- UK scientists helping reduce environmental impact from chemicals
  - For example, Nitrogenous fertiliser consumes 1.2% of the world's total annual energy. Scientists are working to extend nitrogen fixation to maize, rice and wheat, reducing the need for exogenous nitrogen. This would significantly reduce the production costs of world agriculture and have a very positive impact in reducing carbon dioxide generation from chemical manufacture



# ANIMAL HEALTH

---

## 'ONE HEALTH' AGENDA

## COMMONALITY WITH HUMAN HEALTH CARE

Diagnostics

Vaccines/antibiotics/biologics

Disease transmission

- This sector has growing global importance
  - With world population predicted to reach 9.5 billion in 2050, global food production will need to increase
    - poultry production by 300%
    - cattle population by 75%
    - goat and sheep population by 60%



# ANIMAL HEALTH...2

---

- The UK (South of Edinburgh) boasts the largest concentration of animal health researchers in Europe
- Veterinary academic research in UK is growing
  - Funding increased by 67% between 1995/96 and 2009/10
- UK Veterinary Science ranks high in the world
  - Ranked 2nd, after the USA.
  - Annual growth in veterinary publication output is 6% in UK (USA is 3%)
- Large UK pet food market
  - 46% of households have a pet
  - 20 million pets in total
  - Pet food spend is £2.05 billion (2010)
  - Growing 2% annually
- UK has more international reference centres in animal diseases than any other country



# THE UK Agri-Tech Strategy - a reminder

---

## Public sector research

There is increased significant public sector investment in agricultural research

- Over £480 million each year from Government agencies
- £90 million investment in world-class Centers for Agricultural Innovation
  - Part of the Government's UK Strategy for Agricultural Technologies
  - Innovation Centers will support the wide-scale adoption of innovation and technology across key sectors, technologies and skills in the food and farming supply chain
- This includes up to £10 million for a Centre for Agricultural Informatics and Metrics of Sustainability which will use data from farms, laboratories and retailers to drive innovation, helping the UK exploit the potential of big data and informatics
- Creating a £70 million Agri-Tech Catalyst
  - Will improve the translation of research into practice
  - Includes £10 million to support the transfer of technology and new products to developing countries
  - Now 77 confirmed catalyst projects funded





# UK Government Support - Funding and Programmes

---

## Innovate UK and the Biotechnology and Biological Sciences Research Council (BBSRC)

Significant research funding adds to the R & D strengths of the UK sector, including:

- £60 million catalyst fund to support 'proof of concept' of near-market agricultural innovations
- £10 million earmarked for supporting the transfer of technology and new products to developing countries
- £90 million (over 5 years) to establish a small number of Centres of agricultural innovation
- The recent £20m SCPRID initiative, funded by BBSRC, the Bill and Melinda Gates Foundation and the Indian Government, supports high quality research to improve sustainable production of major food crops in developing countries
- Defra 25 year Food and Farming Plan



# NEED TO OFFER COMMERCIALISATION ROUTES

---

- Greater access to new technologies
  - Greater access to investment opportunities
  - Easier environment to establish proof-of-concept studies
  - More Government/EU support to de-risk early stage investment
  - Learn to live with risk
- Need to examine regulatory hurdles and look at alternatives
    - e.g. a standards approach



# THE Agriculture Technology Organisation

---

The Agri-Tech Organisation is THE centre of excellence and first port of call for overseas companies looking for trade and investment opportunities in the UK and for UK-based companies seeking to expand their international business.

Help is provided to large scale businesses, SMEs and institutions to entice foreign investment and encourage sales of UK products abroad. Key areas of focus are primarily:

- Plant sciences
- Animal health
- Aquaculture
- Precision agriculture



# Where are we now?

---

Leadership Council Established

We are building on strengths

Innovate UK catalysts very successful:

<https://connect.innovateuk.org/web/biosciencesktn/agri-tech-catalyst>

Government has launched first of the 4 Centres of Excellence:

Agri Metrics Centre Launched October 2015 by Ministers

Other centres subject to business plan clarification but will be formally announced soon but will be in animal health, plant science /resilience and precision/agri engineering



## UK Examples - Funding and Programmes still in place for businesses

---

### UK tax allowances for R&D expenditure

- A generous environment for businesses investing in R&D
- Corporation tax rate (currently 23%, falling to 20% by 2015) can be halved for businesses investing in, and commercialising, new intellectual property under 'R&D tax credit' and 'Patent Box' allowances.
- Capital spent on R&D equipment also allowable usually at the full rate of 100%

### Robust IP Protection

- UK is the second strongest nation on IP protection globally

### Patent Box

- Reduces corporation tax to 10% on profits attributable to qualifying patents
- Specialist support from within ATO in all aspects of investment (not just technology)



# This is just the start

---

For example total list of all catalyst project participants see the knowledge transfer database:

<https://docs.google.com/spreadsheets/d/1YbdeHE4vMzRANuM7NY5hiKsAQVnR6f6s2I0Vq98ejqo/edit?usp=sharing#gid=5&vpid=B2>

**We must work together on the challenges of UNLOCKING THE VALUE FROM INNOVATIVE TECHNOLOGIES..... and USE THEM TO IMPROVE THINGS**

**SAFE, HEALTHY AND SUSTAINABLE FOOD**



# Thank you for listening!!

---

**[Janet.Bainbridge@ukti.gsi.gov.uk](mailto:Janet.Bainbridge@ukti.gsi.gov.uk)**;

**Tel mobile +44(0)7767 006 458**

**[www.gov.uk/ukti](http://www.gov.uk/ukti)**

**[agritech@ukti.gsi.gov.uk](mailto:agritech@ukti.gsi.gov.uk)**

**OR**

**[janet@bainbridgeuk.net](mailto:janet@bainbridgeuk.net)**

**Tel +44(0)7789073035**



# JUST REMEMBER !!

---

**All the data ever collected in the world could be stored onto  
a piece of DNA the size of a pencil!!**

**Just imagine the potential of the bio-economy on  
agriculture !!**

