Food ethics and future food

Rural Officers Gathering
Stoneleigh
15 November

David Pink
Emeritus Professor of Crop Improvement

A potted career history

BSc Biological Sciences at Birmingham

PhD Birmingham/PBI Cambridge

Breeding research – NVRS/IHR/HRI/ Warwick HRI and HAUC

Food Ethics Council

LEAF

LINKING ENVIRONMENT AND FARMING

Food Ethics and Future Food

Food Ethics

and

Future Food

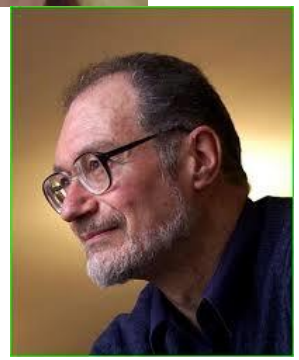
Food Ethics Council members - 2017
















http://www.foodethicscouncil.org/

Food Ethics Council

Food Ethics Council

VISION:
A food system where everyone can enjoy healthy food that is produced and traded **fairly**, **sustainably** and **humanely**.

FEC diagnosis: a dysfunctional food system

- Huge inequalities in access to healthy diets and land to grow food
- Living beyond the means of the planet
- Market and political power concentrated in the hands of a few
- Global economic model no longer fit for purpose
- Many of us are disconnected from our food
- Democratic deficit and decision-making based on political expediency

Food Ethics Council

MISSION:
To be the catalyst for a fair, sustainable and humane food system, by helping businesses, governments and civil society organisations navigate the ethical challenges surrounding food and farming.

What should I do, all things considered?

Ethical principles

Wellbeing

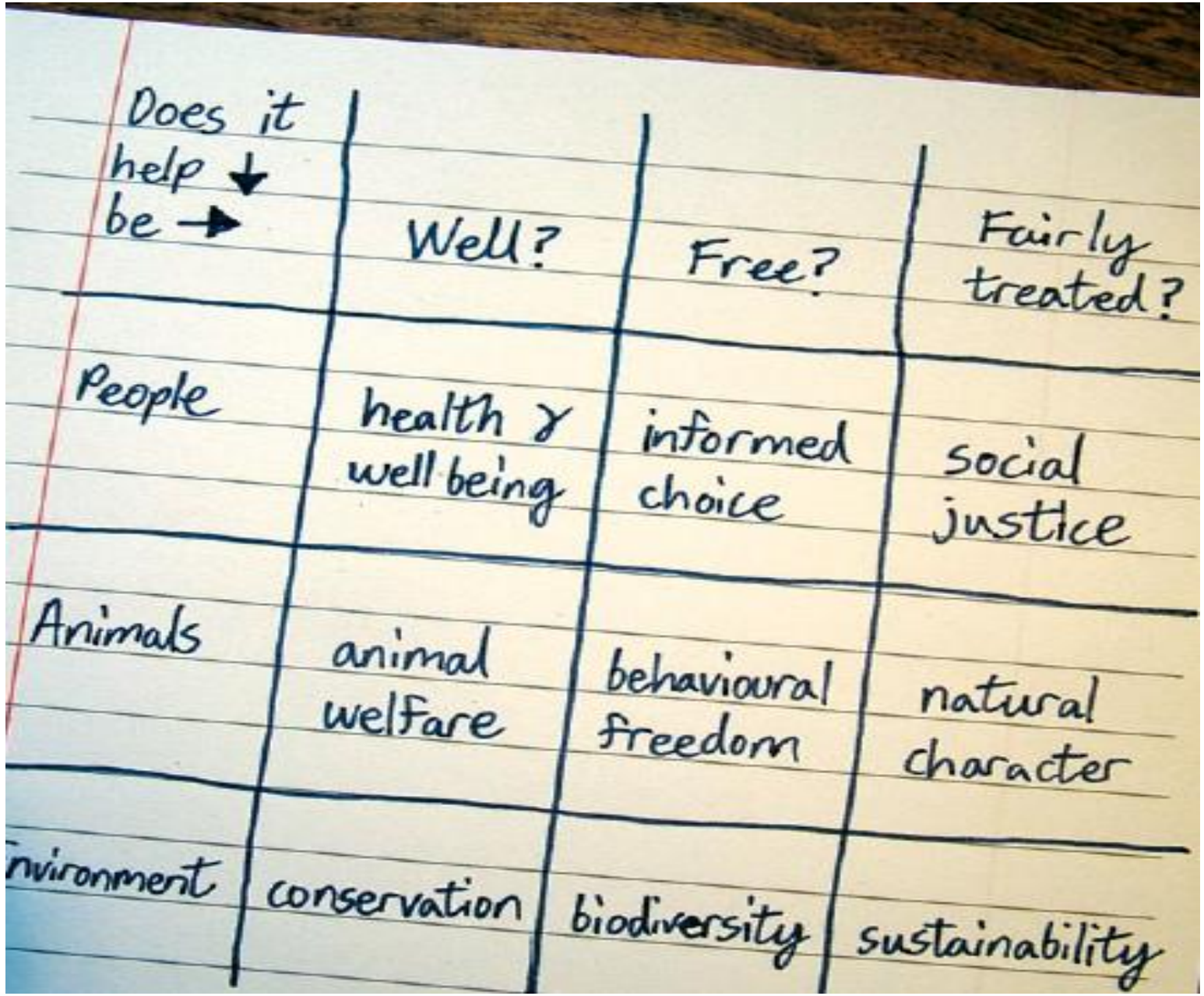
- we should do good and avoid doing harm
- utilitarian : 'greatest good for greatest number'

Autonomy/ Freedom

- we should support freedom of action, identity of others
- concerned with relationships, such as duties and rights
- what do people value about choice?

Justice/ Fairness

- we should support fair opportunities and outcomes
- distributional justice hand in hand with ethic of care
- fairness in the processes of making decisions



Does it help ↓ be →	Well?	Free?	Fairly treated?
People	health & well being	informed choice	social justice
Animals	animal welfare	behavioural freedom	natural character
Environment	conservation	biodiversity	sustainability

Food Ethics Council

Esmée Fairbairn FOUNDATION

- Food Realities Index – marking change over time (are we improving?) but also relative to others (if they can do it why can't we? What can we learn?)
- Policy Barometer-Evaluate selected UK policy and policy ideas to assess how they contribute to fair and sustainable food and farming.

Food Sustainability Index

http://foodsustainability.eiu.com/

- Benchmarking tool to help policy makers identify areas of priority/urgency.
- 2016 25 countries – G20 +6 others (Colombia, Egypt, Ethiopia, Israel, Nigeria and UAE).
- ¾ global population and GDP
- 2017 + 9 countries
- 50 individual metrics (environmental, societal and economic) combined into indicators grouped into 3 areas
  - Food loss and waste
  - Sustainable agriculture
  - Hunger and obesity
- Indicators linked to Sustainable Development Goals
- Scored 0-100

Defining sustainable agriculture

The index takes the view that

- Sustainable agriculture systems allow the present generation to feed themselves whilst allowing future generations to do so with the same resources.
- They should have minimal negative impact on the environment and should strive to have a positive impact by increasing and protecting biodiversity, capturing carbon and respecting water cycles.
- They should produce food that is nutritionally diverse and healthy.
- Sustainable agricultural systems are linked to efficient and sustainable supply chains that reduce food loss and waste .

- Introduction
- Sustainable Agriculture
- Nutritional Challenges
- Leveraging Change
- Final Word

Good start but with room for improvement

- Some metrics blunt
- Some areas not enough metrics – animal welfare

http://foodsustainability.eiu.com/country-ranking/

How is the UK doing?

- 8th overall
- 8th for food loss and waste
- 8th for sustainable agriculture
- 7th for nutritional challenges

http://foodsustainability.eiu.com/country-ranking/

Areas where the UK is performing well:

Scores 1st or equal 1st for

- Quality of R&D and innovation
- Quality of animal welfare regulation
- Quality of policies to address food losses
- Water management
- The degree of property rights protection
- Prevalence of undernourishment (with 19 others)
- Relatively low rates of micronutrient deficiency
- Healthcare expenditure and costs

Three Areas of concern:

- Childhood obesity
- Lack of Diversity in UK Food System
- Youth in Farming

Childhood obesity

- UK ranks 20/25 for prevalence of overweight in 2-18yr olds
- Social gradient with 5yr olds from poorest income groups twice as likely to be obese as those from most affluent households
- 20th in terms of fixed screen time per week
- 18th on prevalence of sugar in diets
- 21st on number of people per fast food restaurant

An outcome of a dysfunctional food system which drives food prices as low as possible by promoting cheap food – which is not conducive to a healthy diet?

Lack of Diversity in UK food system

- Types and sizes of farming and food businesses that can flourish

There are checks and balances in place – competitions authority, grocery code adjudicator but UK has a huge concentration of economic power at retail and agri-business end of supply chain with reports of unfair treatment of smaller players

- Gender diversity

18th for women in farming but signs of improvement– 25,000 more women running farms and rise in number of female agriculture students.
Lack of women on boards of food companies

- Biodiversity

19th for environmental biodiversity, 18th for fertilizer and pesticide use although 7th for share of top 3 crops in agriculture production

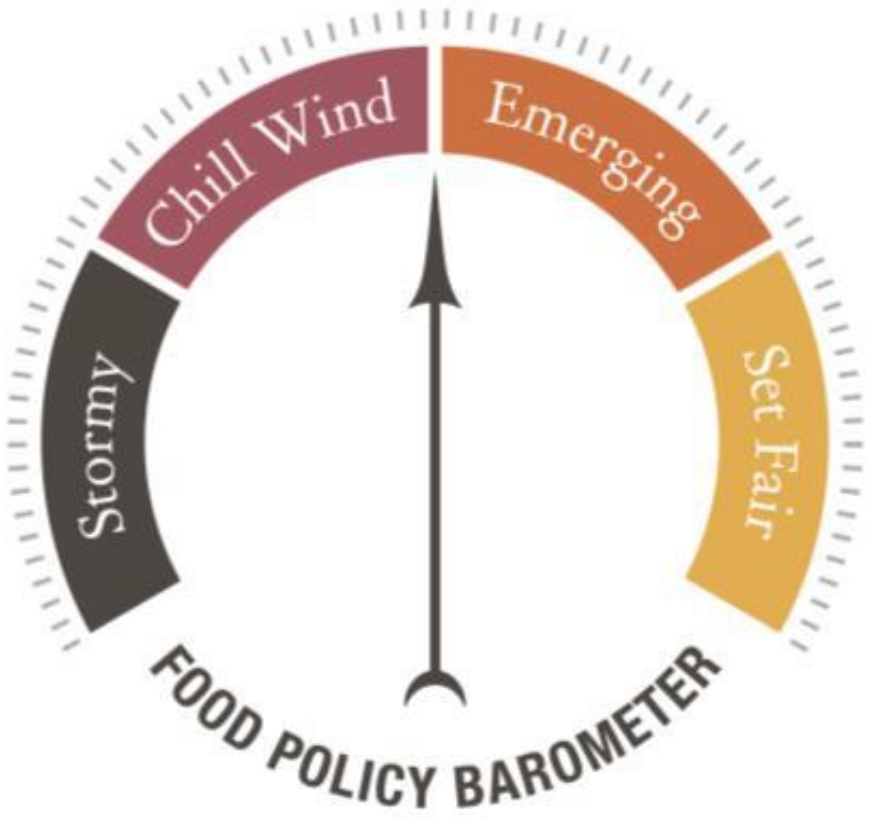
Youth in farming

- 25/25 for youth participation in farming!!!

However

- This may be an artefact of the data- farm ownership
- HAUC student numbers holding up – 97% employment
- Future ways of farming will present high skills opportunities

UK Food Policy Barometer



- Evaluate selected UK policy and policy ideas to assess how they contribute to fair and sustainable food and farming.
- Convene and mobilise food system actors in policy solution roundtables on poor performing policy areas

Food Ethics and Future Food

Future Food-Feeding ourselves

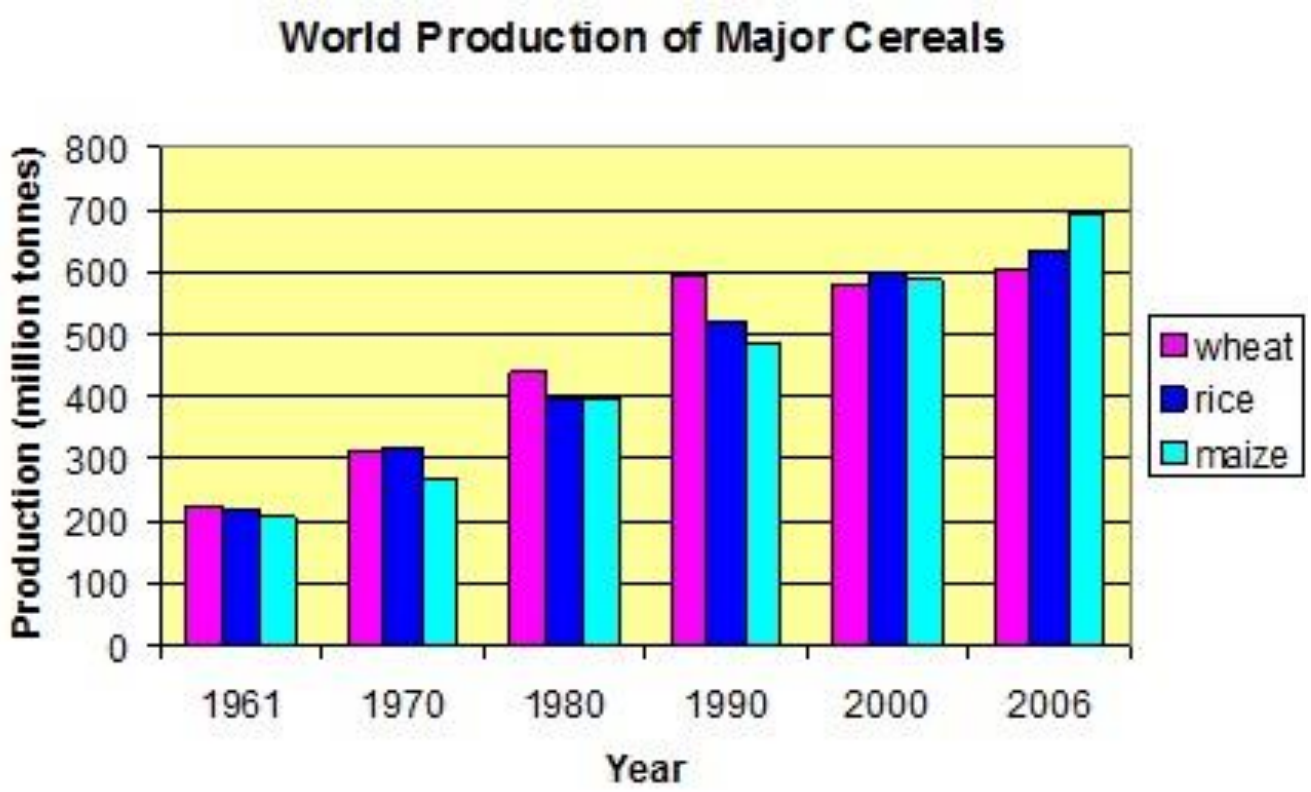
HUGE challenge ahead:

- "Food production will **need to double by 2050 to feed an estimated world population of 9 billion people**" - Jacques Diouf, Director-General of the Food and Agriculture Organisation.

- "Food production will need to **increase by 50% by 2030 to meet rising demand**" - Ban Ki-moon, Secretary-General of the United Nations.

So far we have done a good job

Impact of the 'Green Revolution' on world cereal yields

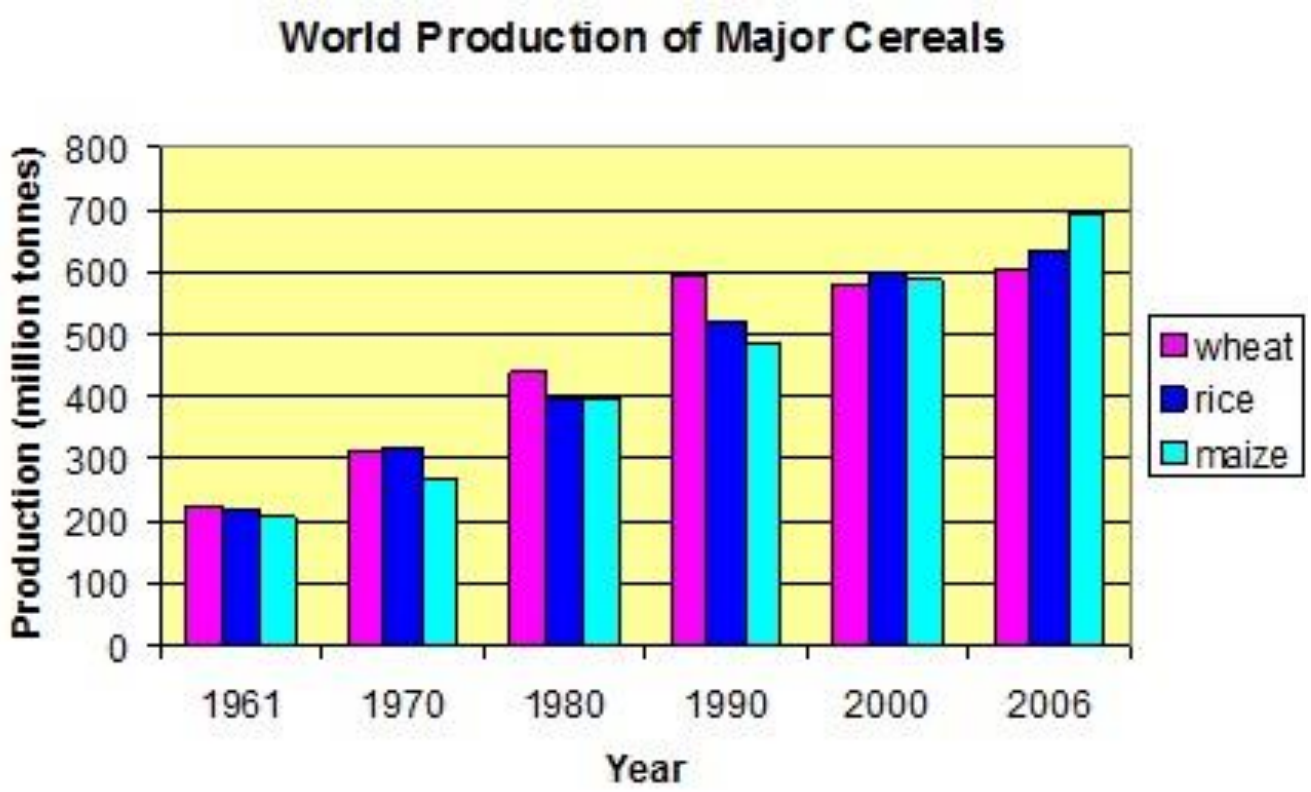


Source: FAO 2007

from 1961 to 2008.

- the human population increased by 100%
- the production of food rose by 150%
- the amount of forests and natural land converted to farming only increased by 10%.

Impact of the 'Green Revolution' on world cereal yields

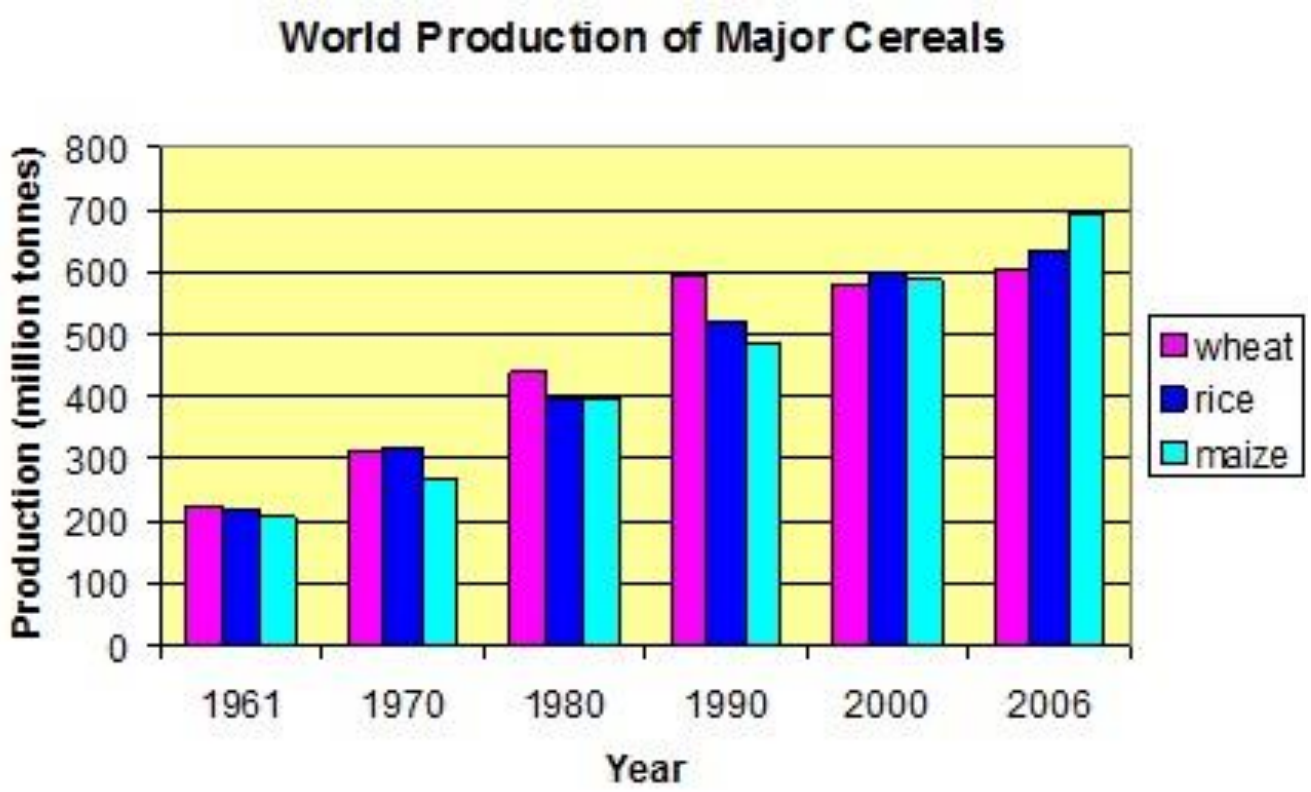


Source: FAO 2007

~50% of gains in yield in 20th century attributable to genetics, the rest to agronomy, crop protection and engineering

So far we have done a good job BUT…

Impact of the 'Green Revolution' on world cereal yields



From 1900-2000 The amount of energy input into agriculture increased 80 times

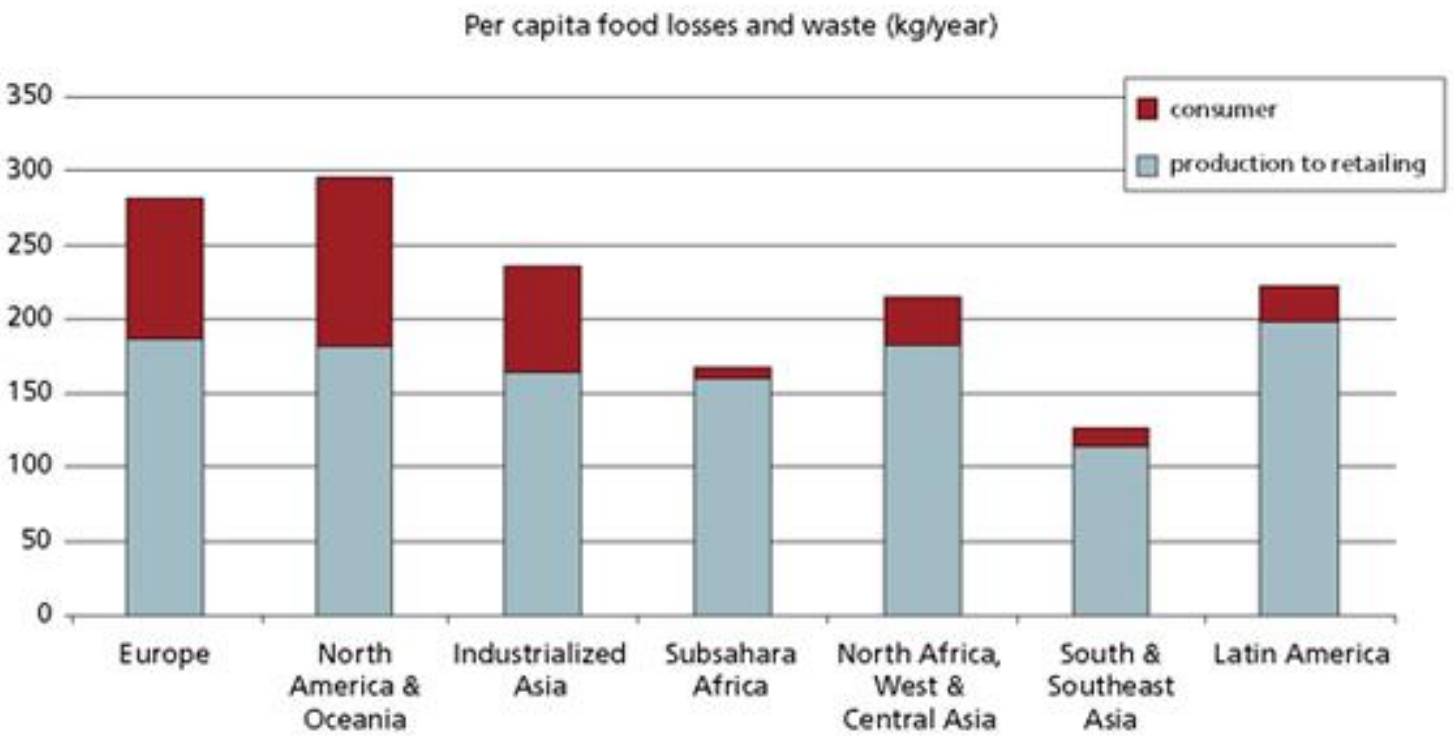
Source: FAO 2007

So far we have done a good job or have we?

- Some 795 million people in the world (1 in 9) do not have enough food to lead a healthy active life.
- The vast majority of the world's hungry people live in developing countries, where 12.9 percent of the population is undernourished.
- Asia is the continent with the most hungry people - two thirds of the total.
- In Sub-Saharan Africa one person in four is undernourished.
- Poor nutrition causes nearly half (45%) of deaths in children under five - 3.1 million children each year.
- One out of six children -- roughly 100 million -- in developing countries is underweight.
- 66 million primary school-age children attend classes hungry, with 23 million in Africa alone.

Ref : www.wfp.org/hunger/stats

Roughly one third of the food produced in the world for human consumption every year, approximately 1.3 billion tonnes gets lost or wasted.



http://www.fao.org/save-food/resources/keyfindings/en/

- Every year, consumers in rich countries waste almost as much food (222 million tonnes) as the entire net food production of sub-Saharan Africa (230 million tonnes).

- The amount of food lost or wasted every year is equivalent to more than half of the world's annual cereals crop (2.3 billion tonnes in 2009/2010).

Closer to home:

Annual food waste within UK households, hospitality and food service, food manufacture, retail and wholesale sectors

- Around 10 million tonnes,
- Worth over £17 billion a year.
- associated with around 20 million tonnes of greenhouse gas (GHG) emissions.
- 60% of this could have been avoided

By weight,

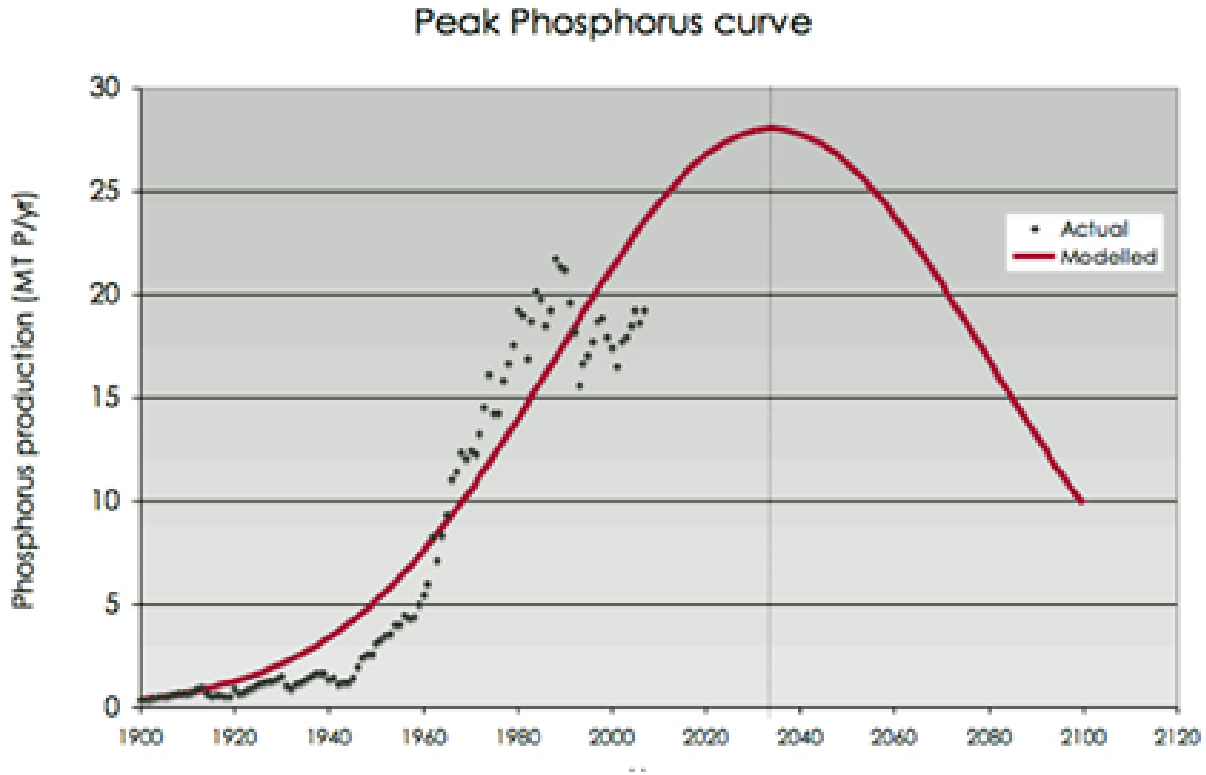
- **household food waste makes up 70% of the UK post-farm-gate total,**
- manufacturing 17%,
- hospitality food service 9%
- retail 2%.

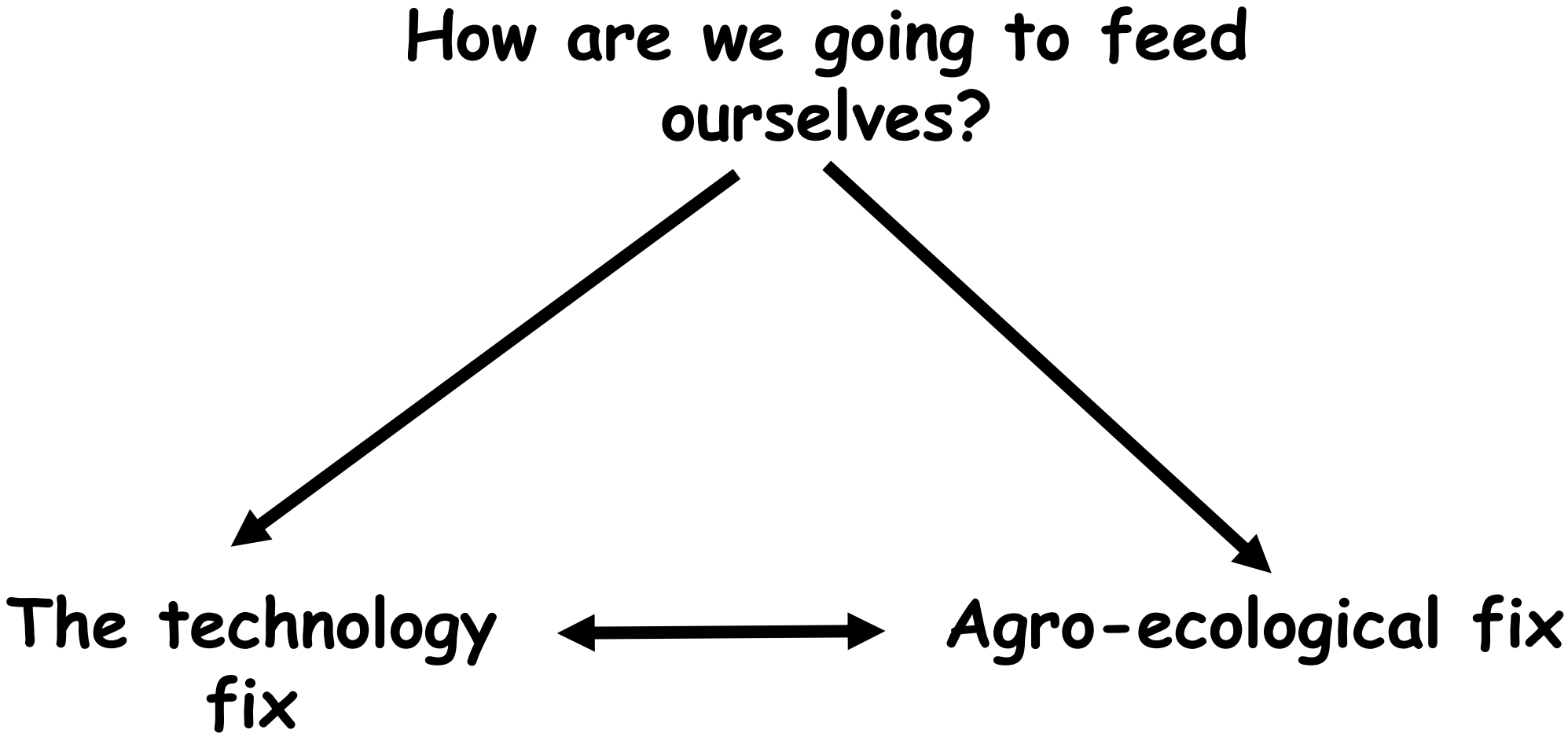
Source - WRAP

Feeding the world now and in future requires social and behavioural change if we are to achieve the aim of a food system where everyone can enjoy healthy food that is produced and traded **fairly**, **sustainably** and **humanely**

…. by 2030 we need to be producing 50% more food. At the same time, we will need 50% more energy, and 30% more fresh water.

More sustainable production means crops of the future will be grown under more stress/suboptimal conditions – we won't have the resources to keep growing in the same way




How are we going to feed ourselves?
The technology fix
Agro-ecological fix

Future Prospects for Plant Breeding

Going Back to the Past to Move Forward in the Future

Plant Genetic Resources

Wild crop relatives!

Old varieties and crop wild relatives have potentially useful traits e.g.

- Pest and disease resistance
- Better nutrient use efficiency
- Better water use efficiency
- Tolerance to climate stresses

<u>How to exploit these?</u>

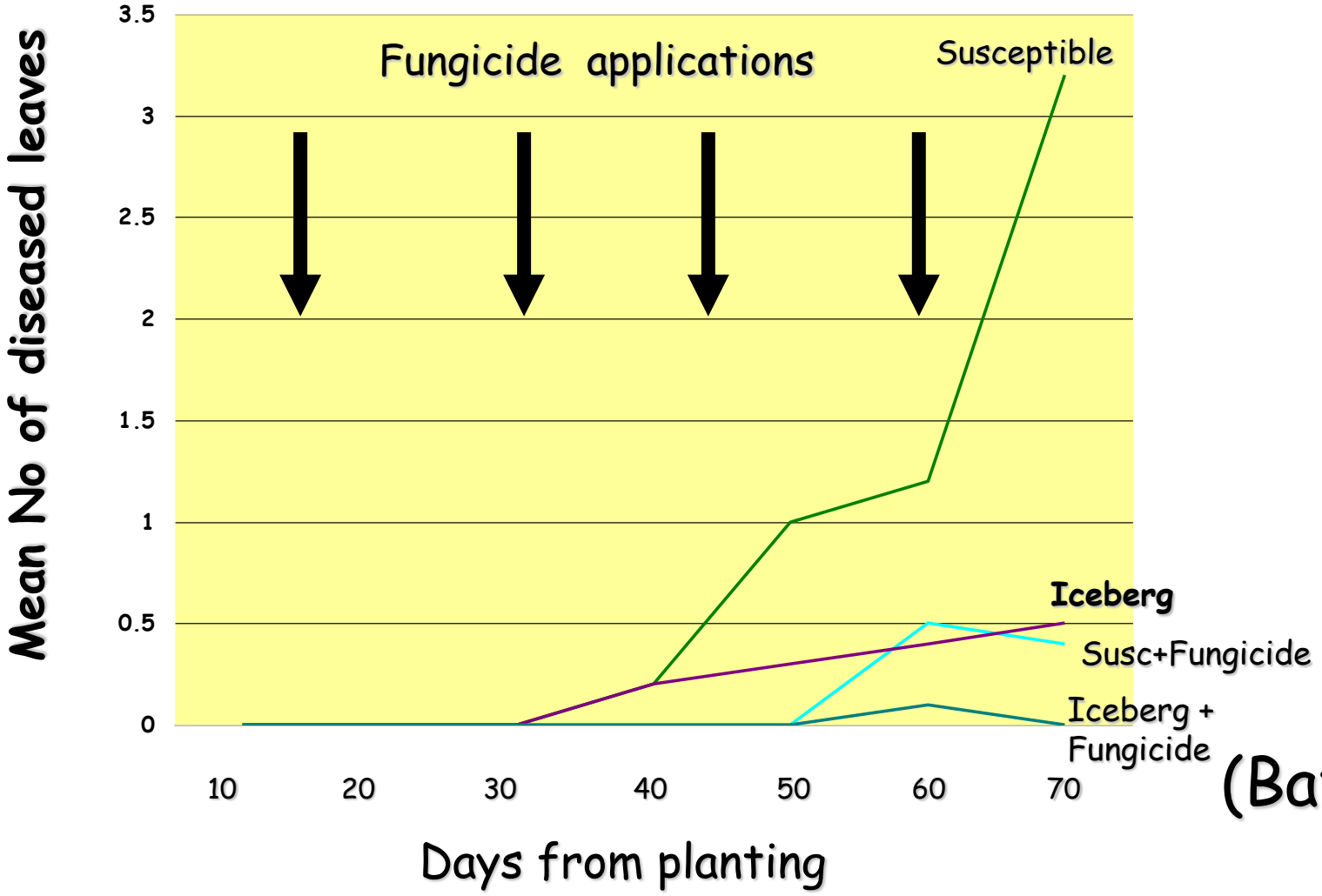
- Grow Heritage Varieties
- Transfer the traits to modern varieties

Smart Breeding
-Selecting at the DNA level

Lettuce Downy Mildew

- Most important lettuce disease world-wide (UK 59% fungicide applications -Defra)
- Fungicide withdrawals
- Fungicide insensitivity

Effectiveness of Field Resistance



cv Iceberg

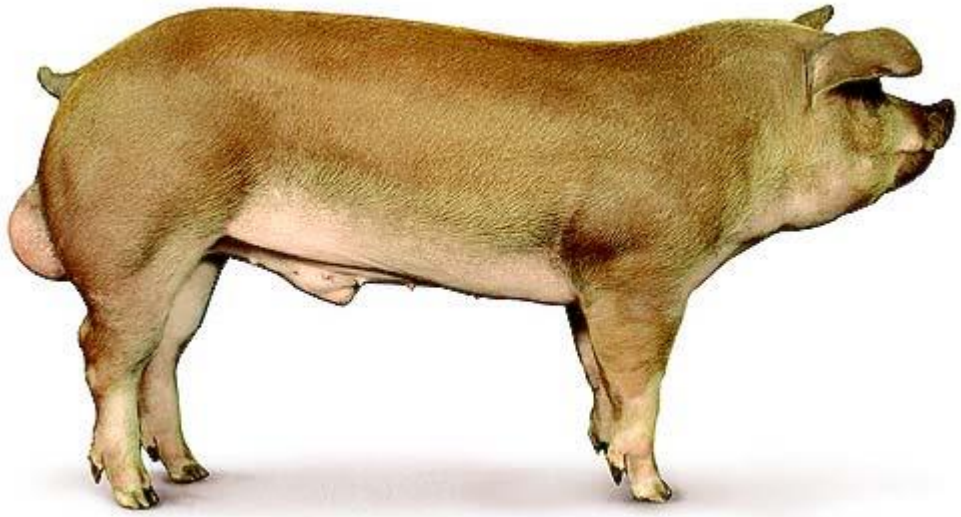
(Batavia blonde à bord rouge)

First cultivated 1872

- 242 lines assessed
- 2 yrs field trials
- 5 sites - UK, USA, NL(x3)
- scored for disease severity at harvest

Targets for smart breeding:

- Yield
- Pest resistance
- Disease resistance
- Taste
- Keeping quality
- Abiotic stress – drought, salinity, temperature
- Nutrient use efficiency
- Water use efficiency



DNA Sequencing

Several years multi national effort and £Ms

A few weeks and £10K

GM crops

2016- 185.1 million hectares of biotech crops were planted by ~18

million farmers in 26 countries.

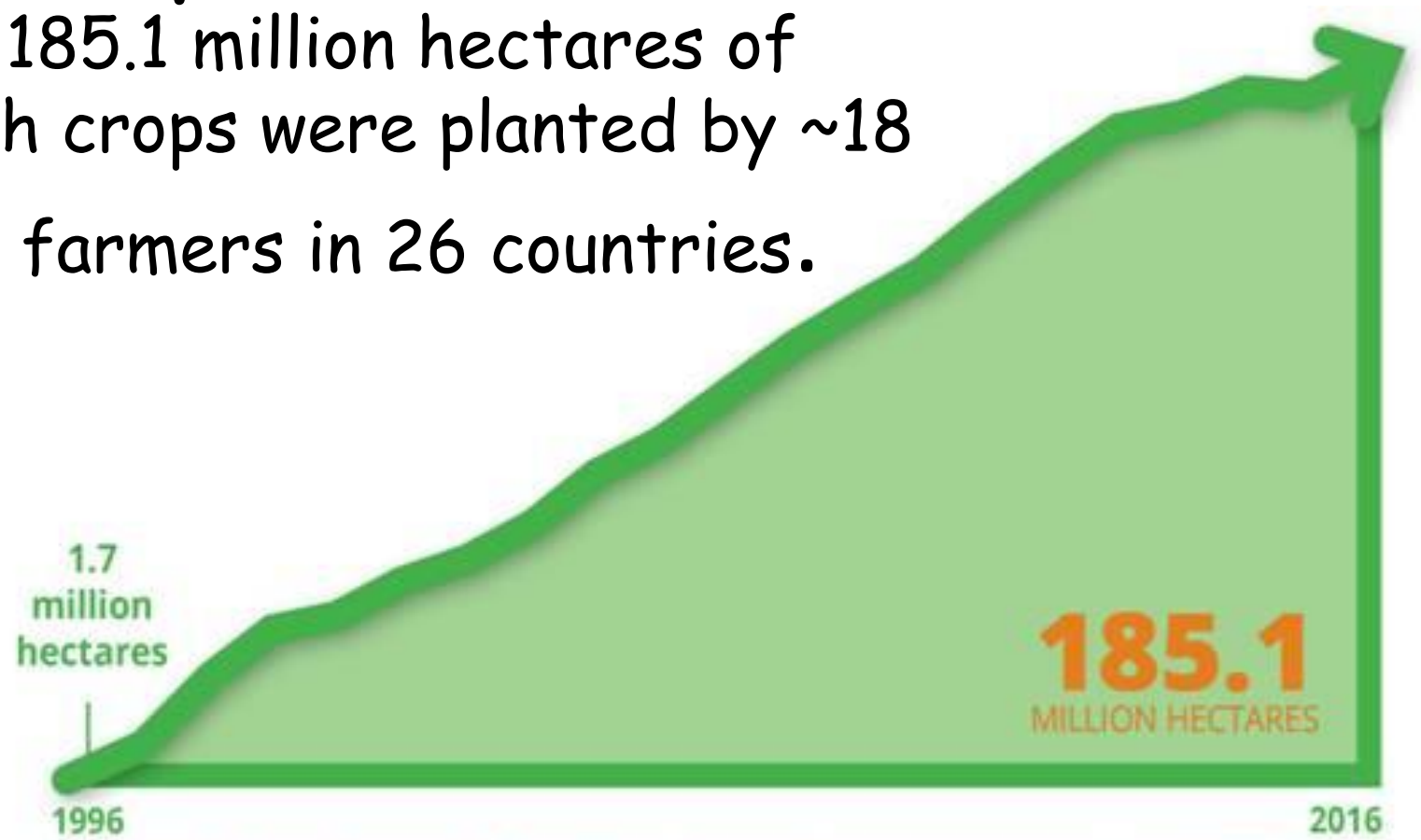
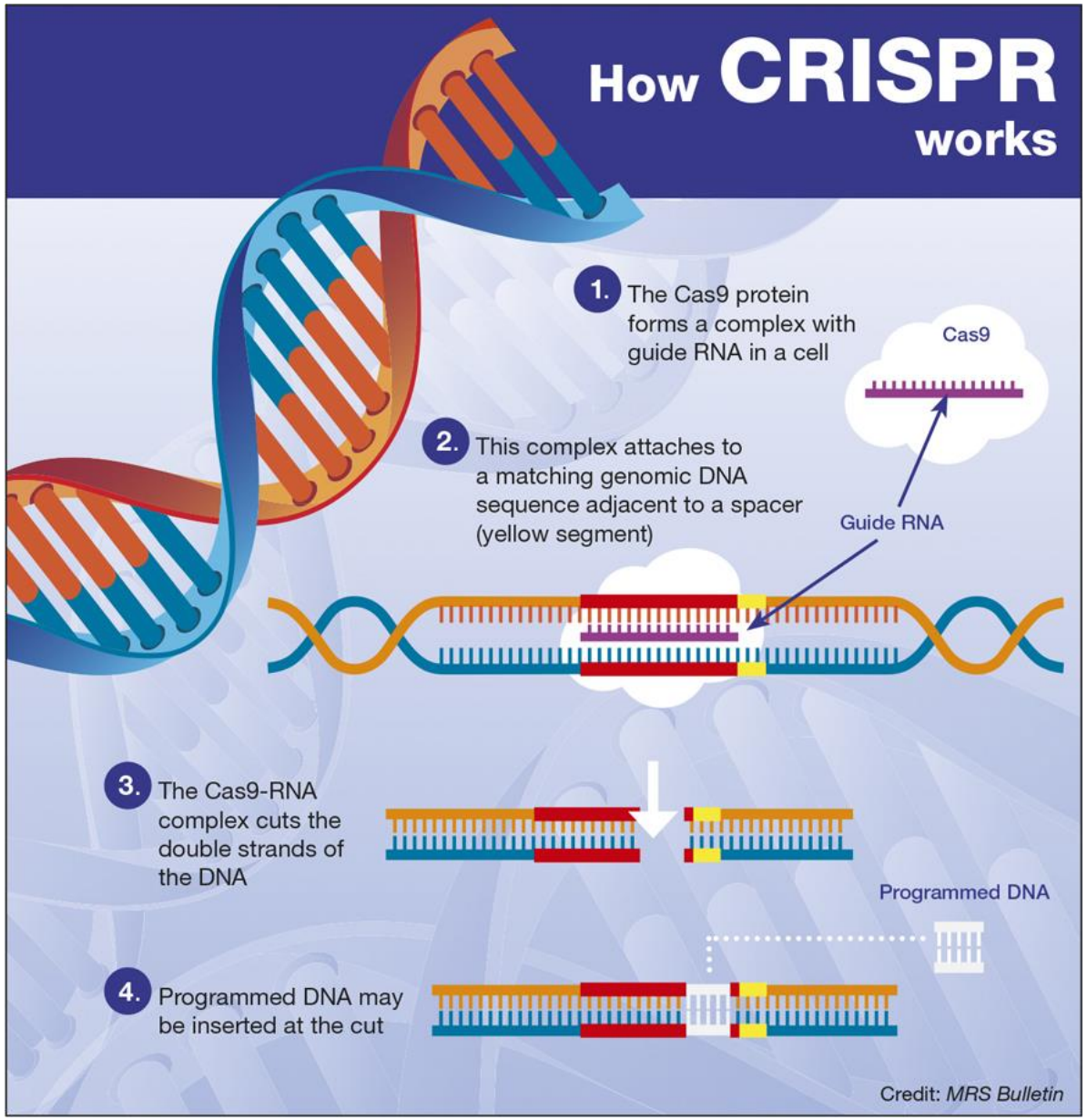


FIGURE 1. GLOBAL AREA OF BIOTECH CROPS, 1996 TO 2016 (MILLION HECTARES).

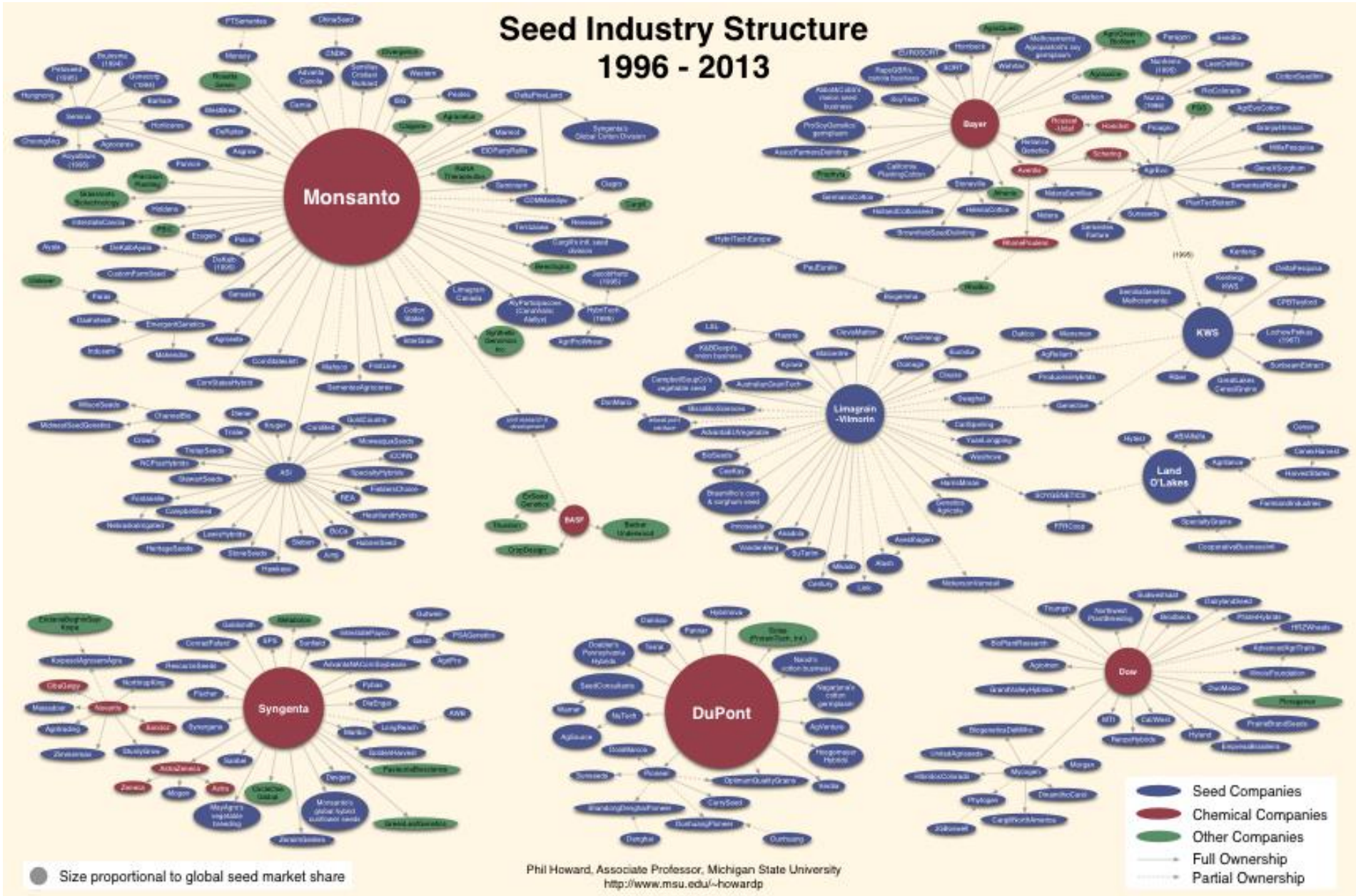
Source: ISAAA, 2016

Clustered
Regularly
Interspaced
Short
Palindromic
Repeat

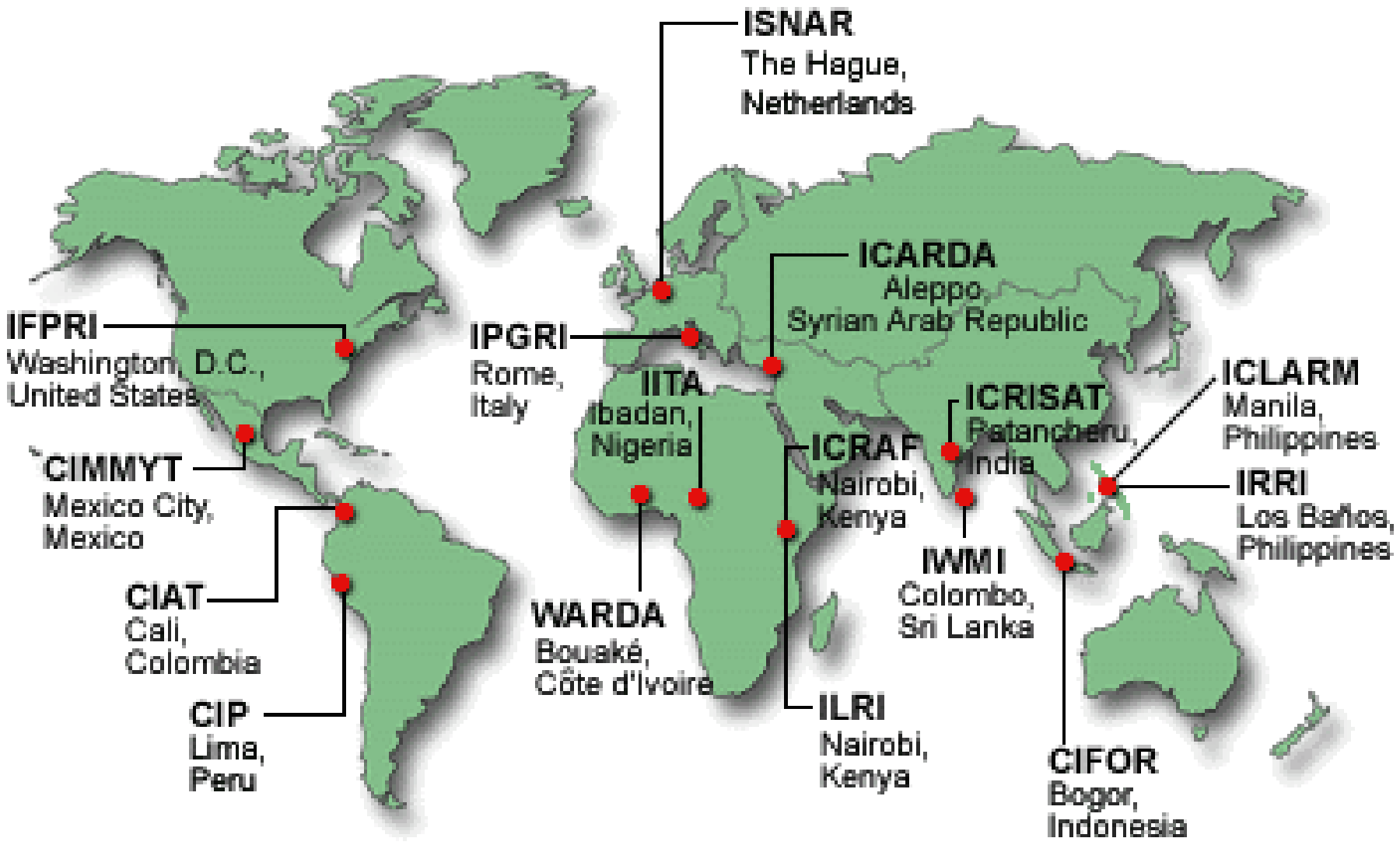


Can get around need for lengthy breeding programmes

Fungicides usually applied every seven days or more often


Seed Industry Structure
1996 - 2013
Monsanto
Bayer
Limagrain -Vilmorin
KWS
Land O'Lakes
ASI
Syngenta
DuPont
Dow
BASF
Seed Companies
Chemical Companies
Other Companies
Full Ownership
Partial Ownership
Size proportional to global seed market share
Phil Howard, Associate Professor, Michigan State University
http://www.msu.edu/~howardp

Consultative Group for International Agricultural Research

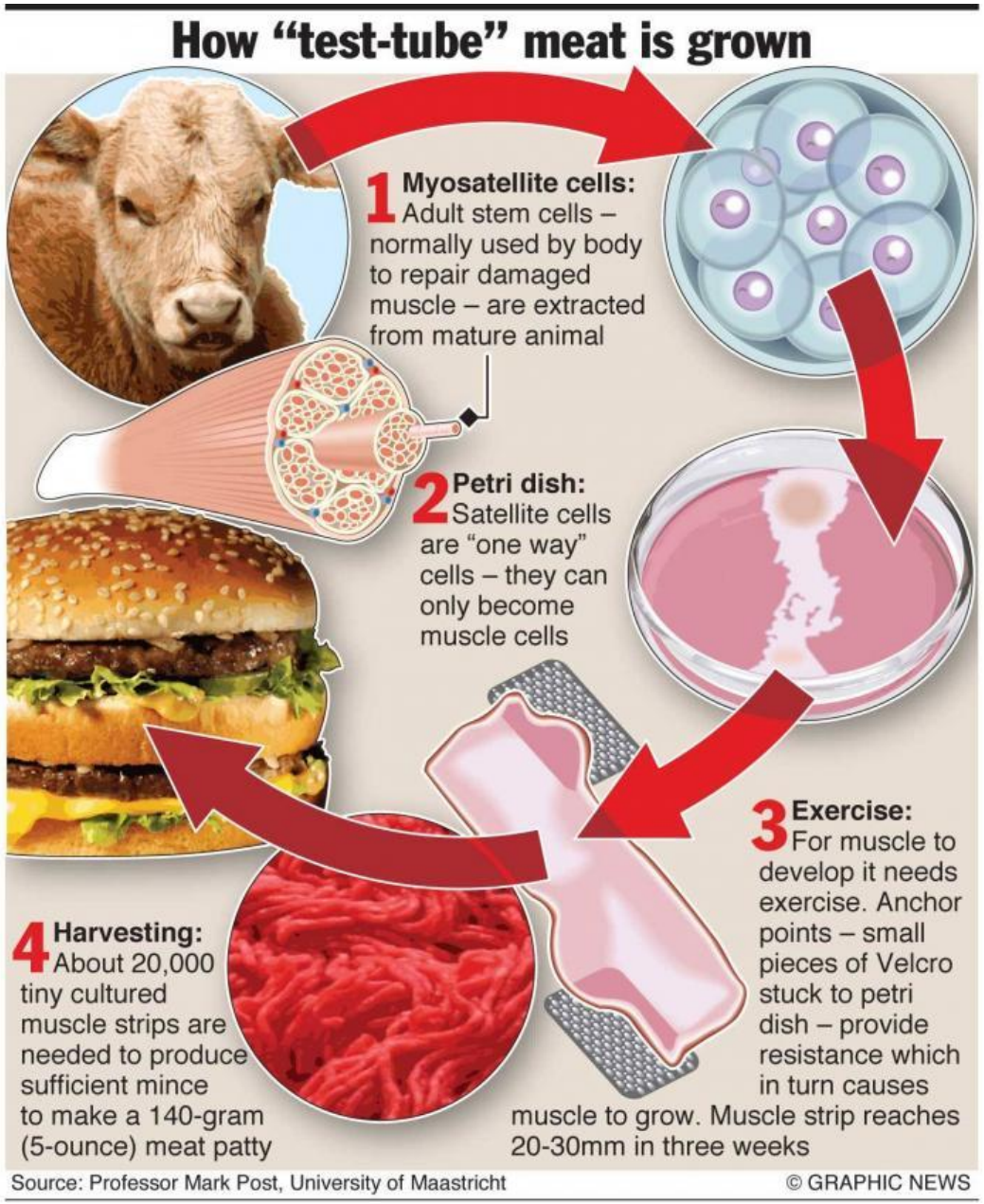


Agronomy/Engineering

Urban Farming

Urban Farming

Urban Farming



Automated Farming

The Hands Free Hectare nears harvest

Posted 22 August

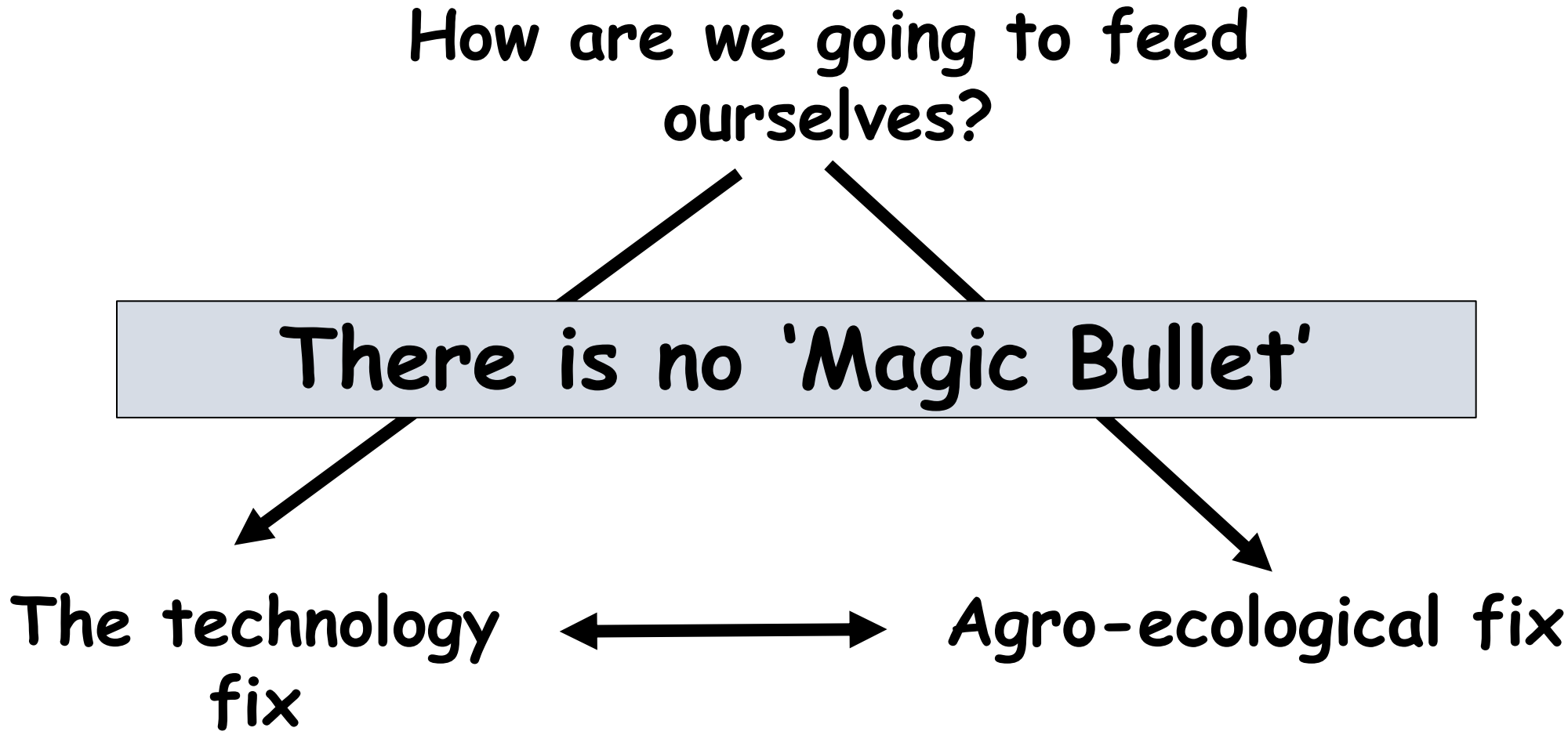
> ***"The crop has done really well; it's nearly matured and looking like it's going to yield quite well."***

The Hands Free Hectare (HFHa) project at Harper Adams University, which aims to be the first in the world to plant, tend and harvest a crop with only drones and autonomous vehicles, is nearing to an end.

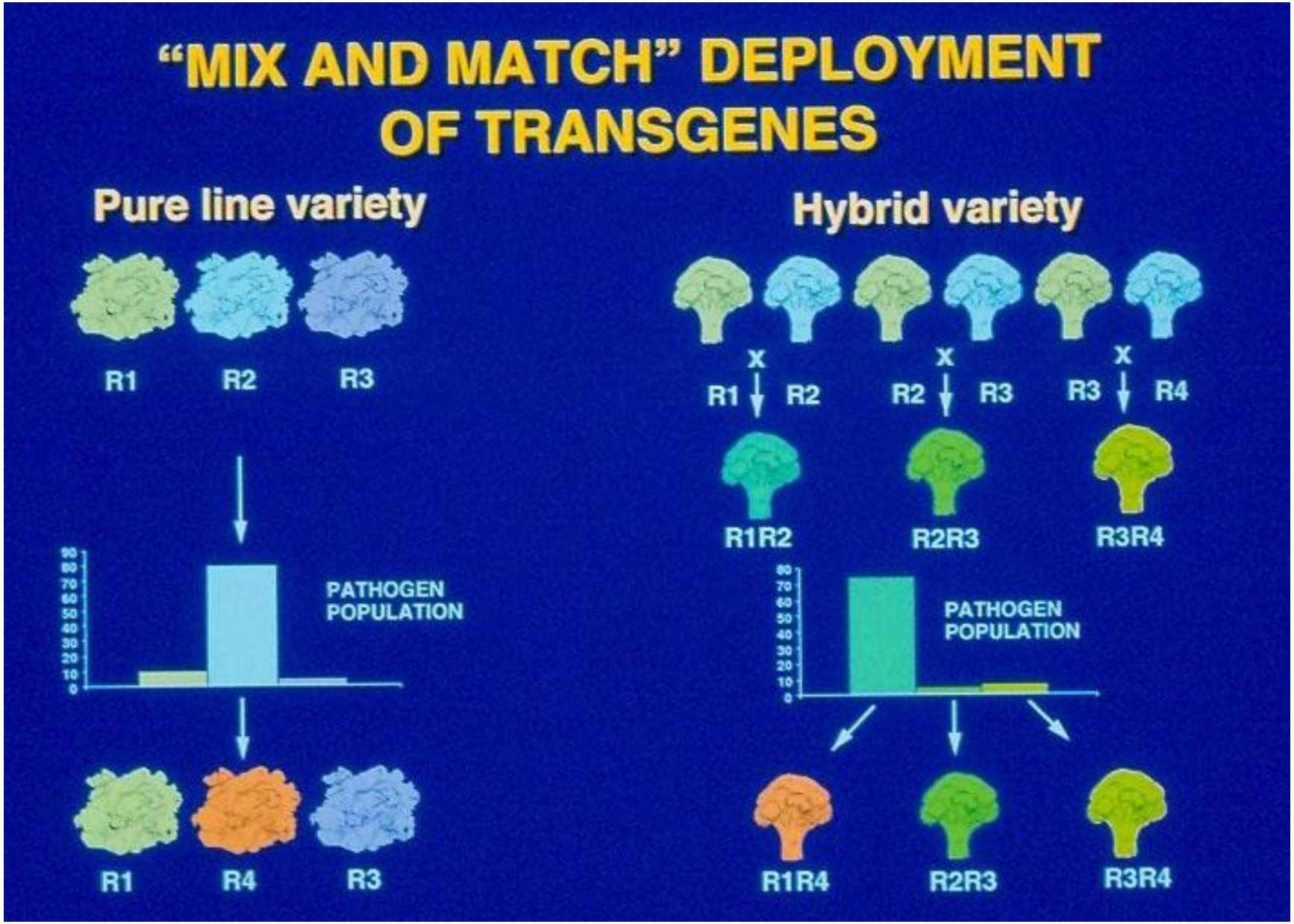
Precision Farming

Precision Farming

Fig. 1. Location of engineered devices for in situ data collection in a cow: (1) ear tag, (2) halter, (3) neck collar with counterweight, (4) reticulorumen bolus (in reticulum), (5) rear leg pedometer, (6) upper tail ring, (7) tail head inject, and (8) vaginal bolus. (Caja et al, 2016)


How are we going to feed ourselves?
There is no 'Magic Bullet'
The technology fix
Agro-ecological fix


MASSEY FERGUSON



Pink, D.A.C. & Puddephat I.J. (1999)

Who's driving?

Between 50-75% of the world's food is produced by smallholder farmers

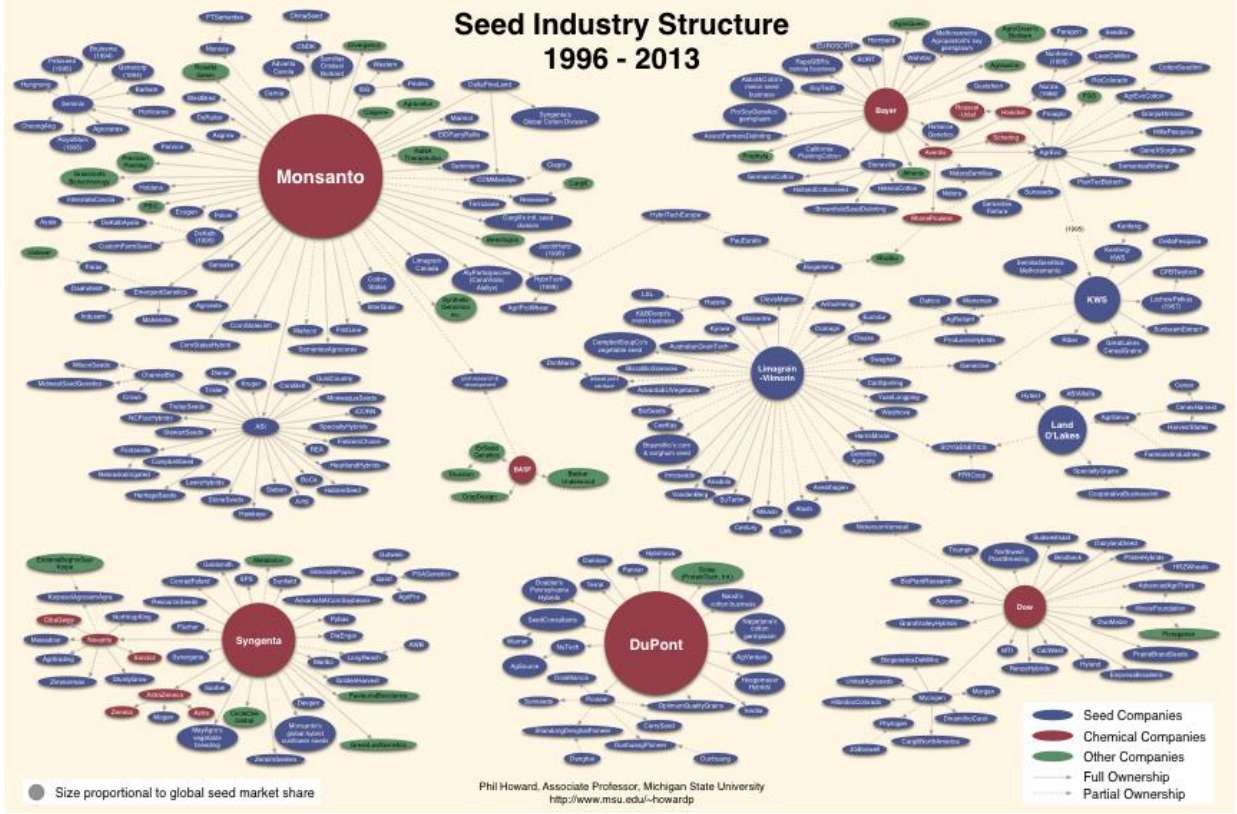
One size doesn't fit all

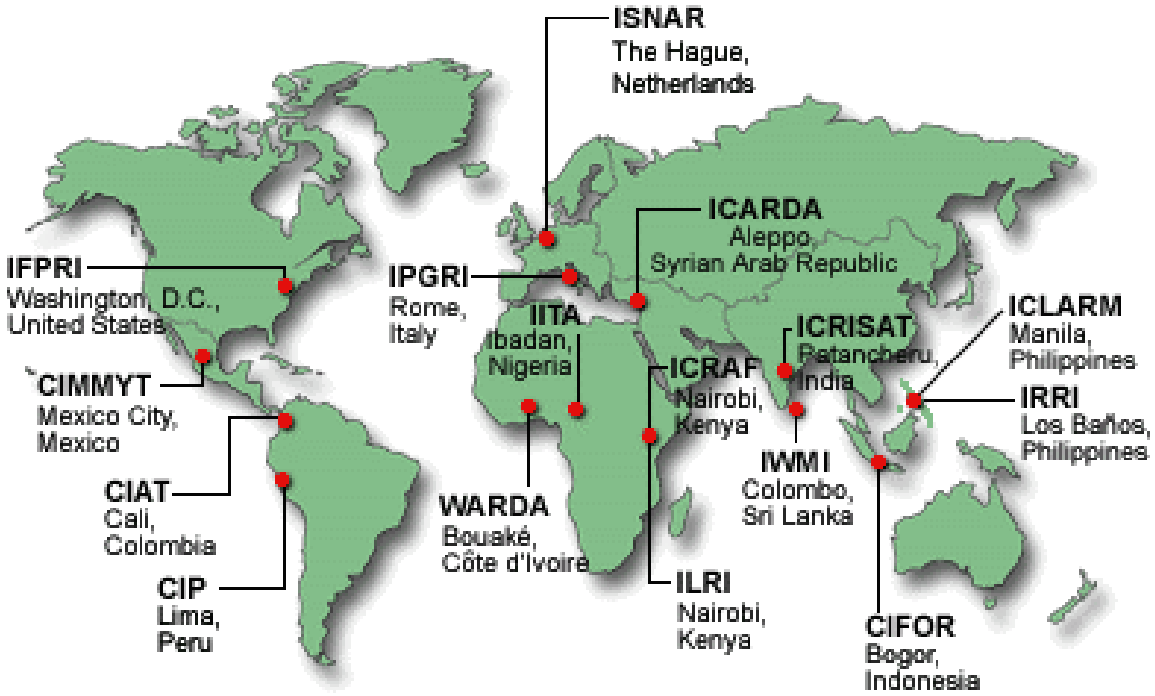
- Eighty percent of the farmland in sub-Saharan Africa and Asia is managed by smallholders (working on up to 10 hectares).
- 75 percent of the world's food is generated from only 12 plants and 5 animal species, making the global food system highly vulnerable to shocks, biodiversity is key to smallholder systems who keep many rustic and climate-resilient varieties and breeds alive.
- Out of the 2.5 billion people in poor countries living directly from the food and agriculture sector, 1.5 billion people live in smallholder households.

One size doesn't fit all

- Smallholders provide up to 80 percent of the food supply in Asia and sub-Saharan Africa.
- Their economic viability and contributions to diversified landscape and culture is threatened by globalization and integration into common economic areas; their fate is either to disappear and become purely self-subsistence producers, or to grow into larger units that can compete with large industrialized farms.

Smallholder farmers need access to appropriate (often existing) technology and genetics


Seed Industry Structure
1996 - 2013
Monsanto
Bayer
KWS
Limagrain
-Vilmorin
Land
O'Lakes
ASI
BASF
Syngenta
DuPont
Dow
Seed Companies
Chemical Companies
Other Companies
Full Ownership
Partial Ownership
Size proportional to global seed market share
Phil Howard, Associate Professor, Michigan State University
http://www.msu.edu/~howardp


ISNAR
The Hague,
Netherlands
ICARDA
Aleppo,
Syrian Arab Republic
IFPRI
Washington, D.C.,
United States
IPGRI
Rome,
Italy
IITA
Ibadan,
Nigeria
ICRISAT
Patancheru,
India
ICLARM
Manila,
Philippines
ICRAF
Nairobi,
Kenya
IRRI
Los Baños,
Philippines
CIMMYT
Mexico City,
Mexico
IWMI
Colombo,
Sri Lanka
CIAT
Cali,
Colombia
WARDA
Bouaké,
Côte d'Ivoire
ILRI
Nairobi,
Kenya
CIP
Lima,
Peru
CIFOR
Bogor,
Indonesia

- Women comprise an average of 43 percent of the agricultural labour force of developing countries
- Women are the quiet drivers of change towards more sustainable production systems and a more varied and healthier diet
- If women farmers had the same access to productive resources as men, they could increase yields on their farms by 20-30 percent, lifting 100-150 million people out of hunger.

Source FAO

Thank you