New Zealand's top policy and industry priorities and needs

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New Zealand Mission to the EU

TempAg
SCIENCE FEEDING TEMPERATE AGRICULTURE

"TOWARDS 2025": NZ'S BUSINESS GROWTH AGENDA

- Exports to increase from 30% to 40% of GDP by 2025 through adding more value to volume.
- Primary exports to double from $32 billion (2012) to $64 billion by 2025.
- Maximise agricultural productivity while reducing environmental impacts.

Economic drivers for sustainability

- NZ farmers do not receive subsidies
- To get NZ farmers to voluntarily comply with national policies (e.g. Freshwater Mgt – focuses on enhancing water quality) we need to offer them an economic carrot.
- The carrot is that we produce good quality products using sustainable practices.
- However, we don’t fully capture the products’ value as their sustainable credentials seldom get recognised.
- Correcting this would deliver $ to the producer from the consumer and encourage more sustainable practice.

NZ's Policy on Freshwater Management (2014)

- Strong national policy framework for freshwater management.
- Managed at regional scale by regional authorities.
- Supported by industry guidelines, extension and quality assurance schemes that help farmers adhere to this policy.

NZ's Policy on Freshwater Management

Some of the requirements include:-

- Protecting fresh water's life-supporting capacity
- Protecting human health via water's recreational use
- Maintain or improve the overall quality of fresh water within a region
- Protect wetlands and outstanding freshwater bodies
- Take an integrated approach to managing land use, fresh water, and coastal water
- involve local Maori in decision-making and management of fresh water.

Future considerations

Aiming for sustainable agriculture in face of environmental and economic shocks

NZ will see increasing frequency of:-

- High-intensity storms that cause soil erosion and flooding
- Drought events, impacting crop yields and feed planning
- increased temperatures and fine spells which promote algae growth in rivers.

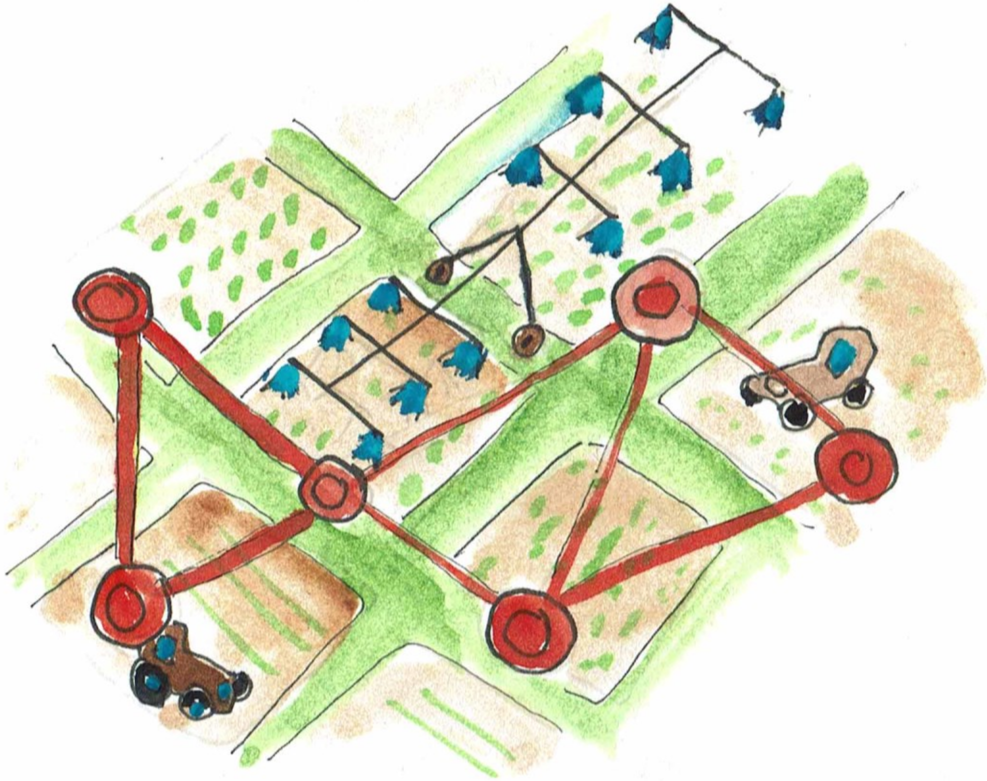
TOWARDS FUTURE-PROOFING AGRICULTURAL SUSTAINABILITY

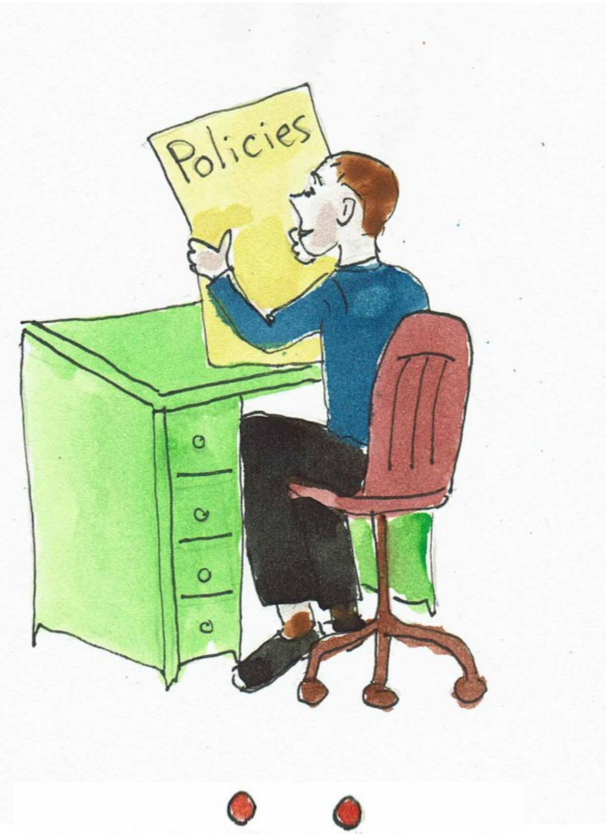
- NZ agricultural systems need to consider how to develop/improve resilience to economic and environmental shocks
- Sustainability metrics that guide land use suitability and decision making in face of economic and environmental shocks are not well characterised
- Focus on data management and connectivity across the whole supply chain, from genomics to the consumer, and associated barriers to uptake.

POLICY NEEDS for SUST. TEMP. AG.

Freija van Duijne

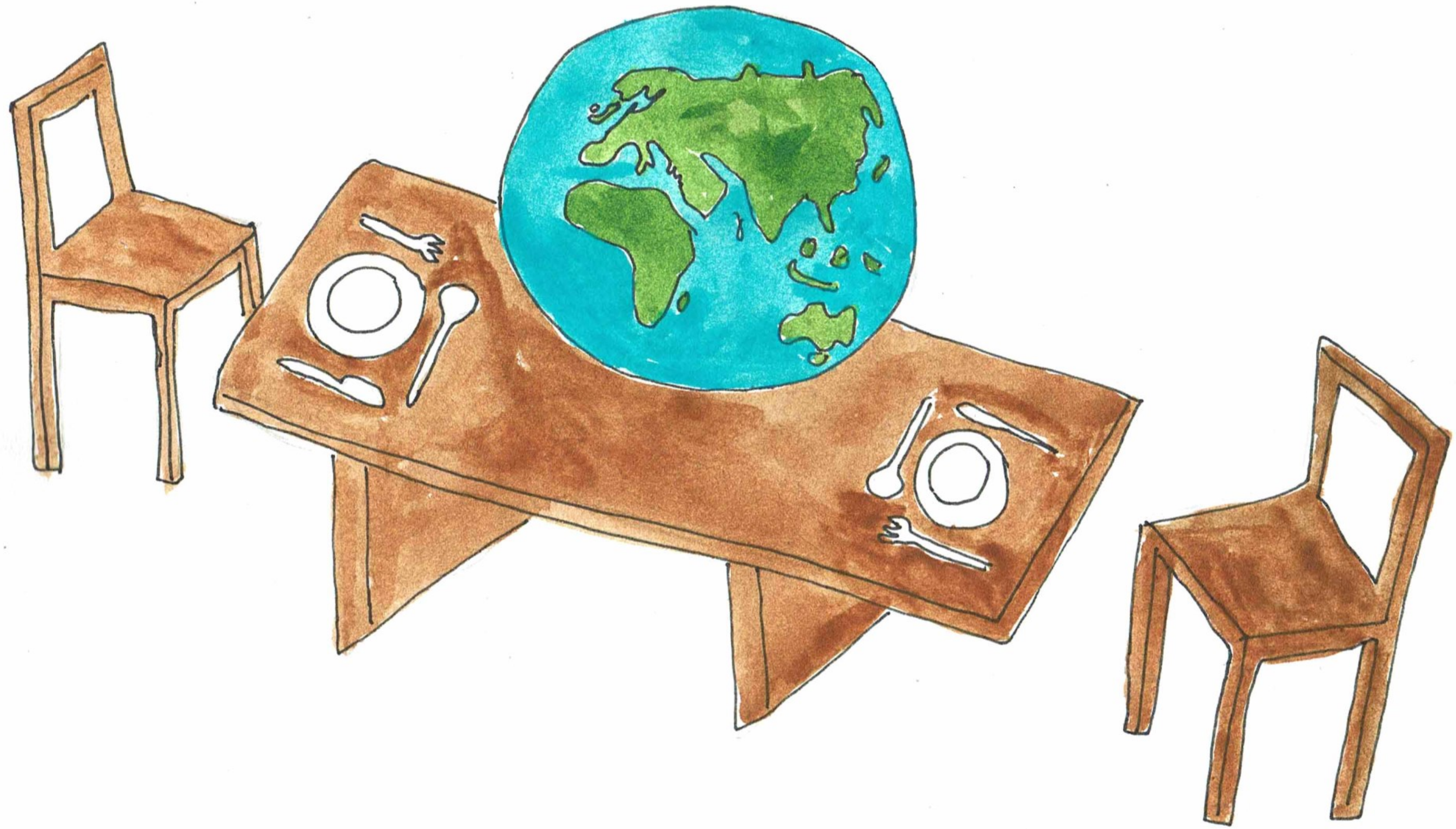
TECHNICAL APPROACH

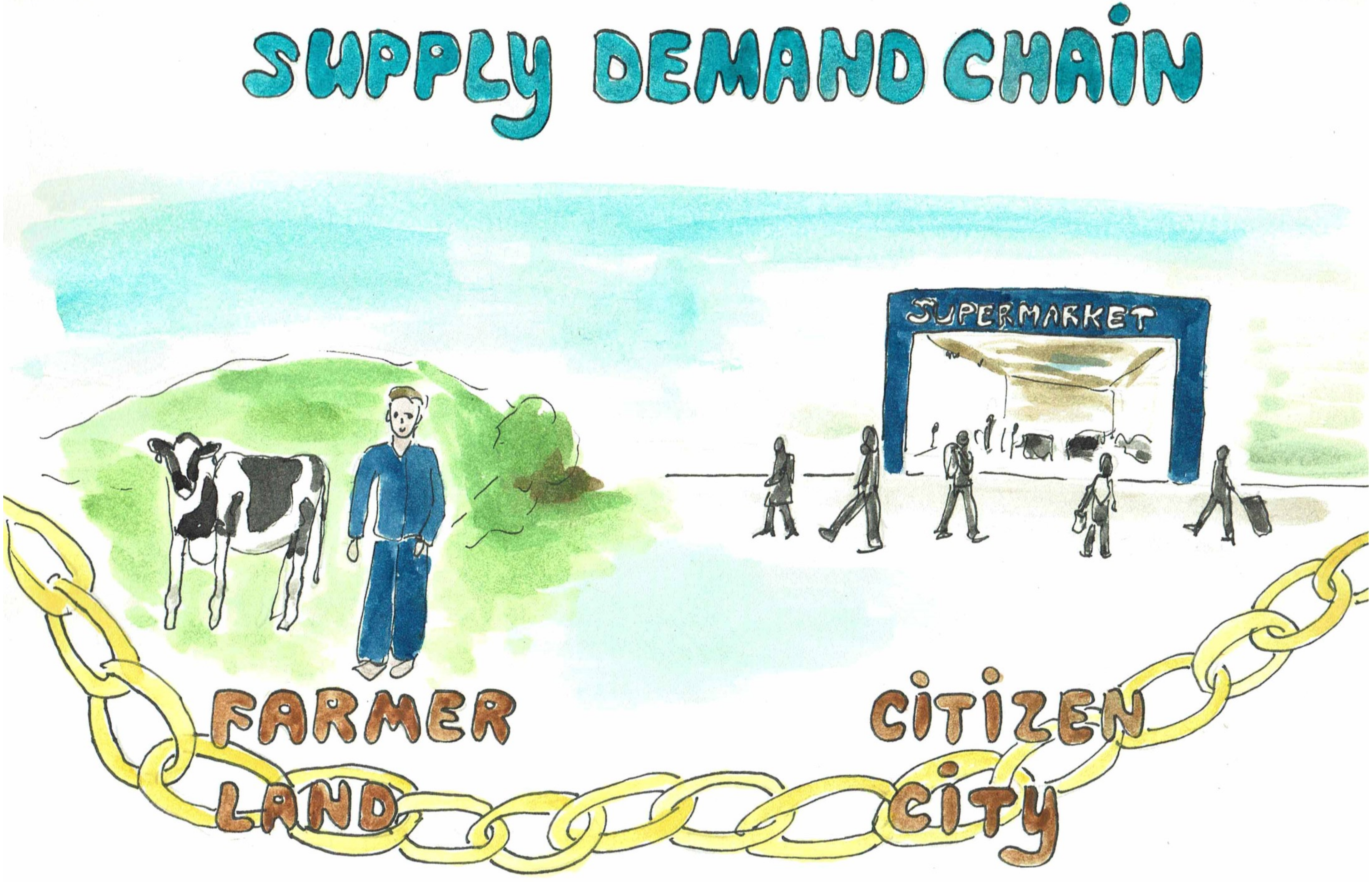




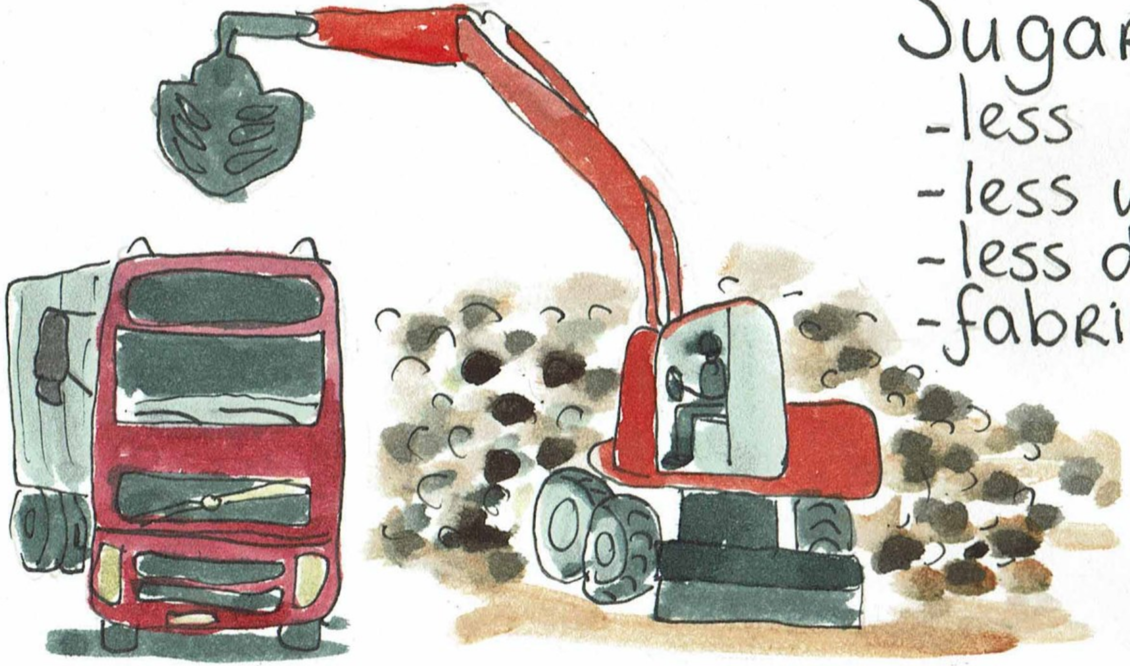
YIELD GAPS TECH SYSTEMS POLICIES

WHAT ABOUT DEMAND?




SUPPLY DEMAND CHAIN
SUPERMARKET
FARMER
LAND
CITIZEN
CITY

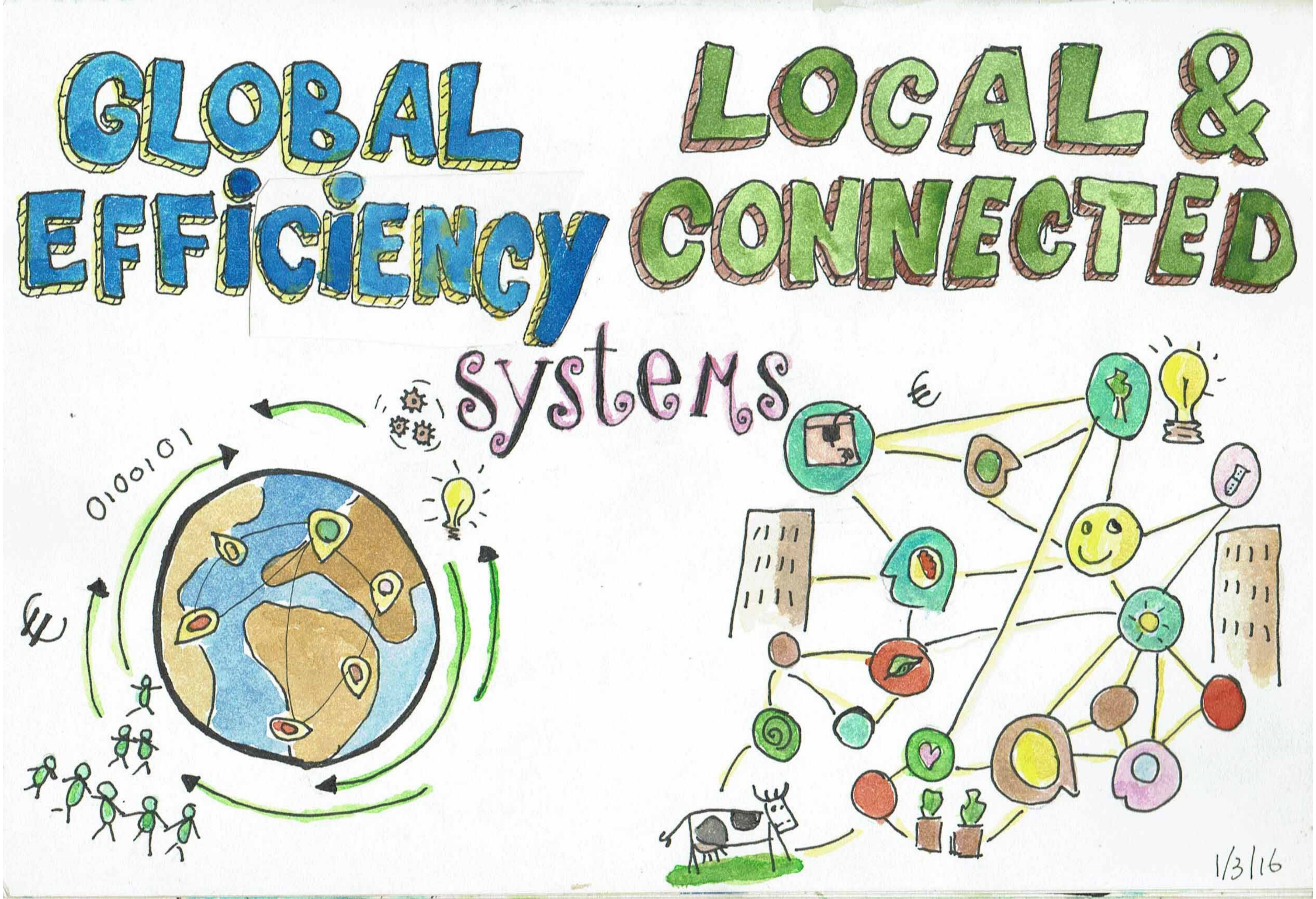
BIGGER THAN N+1



Sugar beets in winter
- less chemicals
- less weeds in autumn
- less diseases
- fabrics can run twice

take a bigger step

INTEGRAL SYSTEMS APPROACH


GLOBAL EFFICIENCY
LOCAL & CONNECTED
systems
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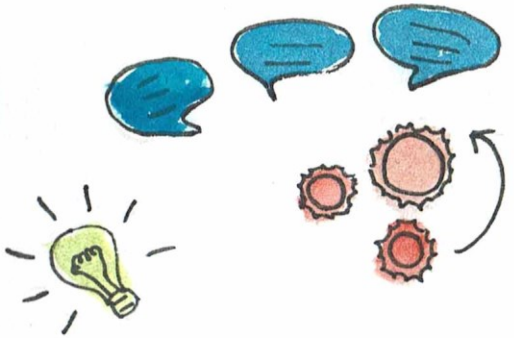
PEOPLE AS KNOWLEDGE CARRIERS



Collaboration in the knowledge system
Flow of knowledge
Innovation needs diversity

Questions?

thanks

Freija van Duijne

European Research and Innovation Policy

Bram Moeskops – Senior Scientific Coordinator

What is TP Organics?

- O … and low-i …
- O … to agric …
- O … civil soci …
- E …

Individual ETPs

Bio-based economy	Energy	Environment	ICT	Production and processes	Transport
EATIP	Biofuels	WssTP	ARTEMIS	ECTP	ACARE
ETPGAH	EU PV TP		EUROP	ESTEP	ERRAC
Food for Life	TPWind		ETP4HPC	EuMaT	ERTRAC
Forest-based	RHC		ENIAC	FTC	Logistics
Plants	SmartGrids		EPoSS	SusChem	Waterborne
FABRE TP	SNETP		ISI	Nanomedicine	
TP Organics	ZEP		Net!Works	ETP-SMR	
			NEM	Manufuture	
			NESSI		
			Photonics 21		

Cross ETP Initiatives

- Nanofutures
- Industrial Safety

Last updated on: 2013-07-12

Members of TP Organics

Business representatives

More then 300 active SMEs:

Cooperation with the Agri Food sector group of the Enterprises Europe Network in terms of knowledge management, technology transfer, SME Instruments.

International

European CSOs

Education and Science

Research Centers, Universities, Scientists, Advisory Services, Innovation Brokers

National Mirrors

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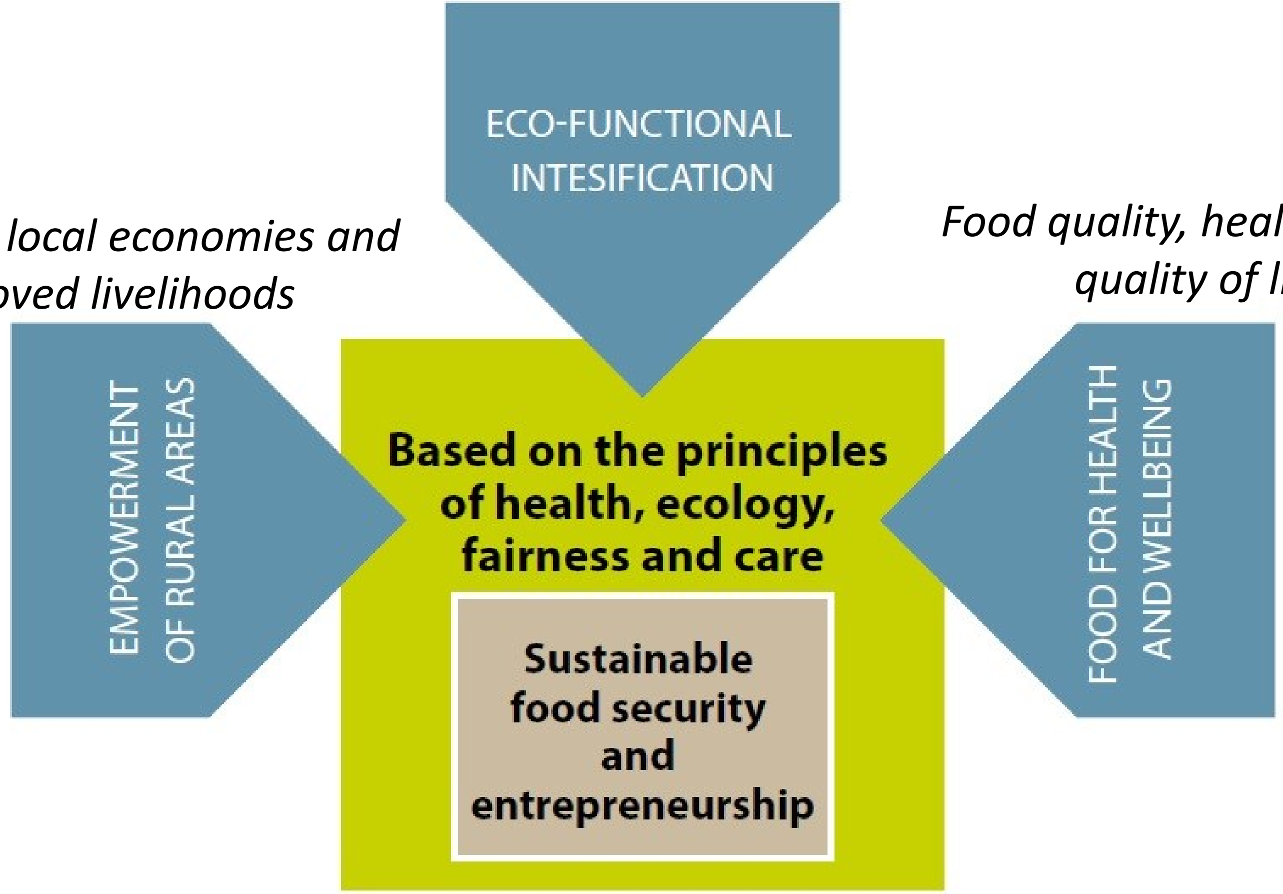
Research vision

Productivity, stability and resilience of agro-ecosystems

Diversified local economies and improved livelihoods

Food quality, healthy diets, quality of life



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Eco-functional intensification

- More efficient use of natural resources and processes to achieve high productivity and yield stability
- Combine tacit farmer knowledge with new insights in the biological and (agro-)ecological sciences
- Builds on the knowledge of all actors
- Organic farmers strive to combine a high level of overall productivity with high environmental standards, based on natural resources

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Empowerment of rural areas

- Agriculture and food production are key to empowerment of local economies
- Organic farmers provide a range of services in rural economies
- Organic farming is preferred option for regional development
- Effective support policies and innovation systems are needed in order to capitalise on this potential.

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Food for health and well-being

- High quality foods are the basis for healthy diets, wellbeing and quality of life
- Need food processing technology that meets the highest environmental standards and only minimally alters the intrinsic qualities of the food
- Sustainable Consumption: increase consumer understanding and engagement
- Organic food systems offers a model of Sustainable Consumption

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Strengths of organic farming

Organic farming is resource efficient

- Organic agriculture is less reliant on external inputs
- Use of energy-intensive nitrogen fertilisers banned
- Use of mined-phosphorous is restricted
- Possible to reduce inputs of fertiliser and energy by 34–53%, and the use of plant protection products by 97% (Mäder et al., 2002)

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Strengths of organic farming

Organic farms are multi-functional

- Organic farmers allocate resources (labour, land, internal inputs or farm infrastructure) to different activities
- Organic farmers optimise performance of whole farm instead of maximising yields
  - income
  - welfare
  - ecosystems services

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Strengths of organic farming

Organic farms provide more public goods

- Biodiversity: 30 % higher diversity and abundance (flora/fauna)
- Climate change mitigation and adaptation: Increased SOM or Corg-contents: Ranging from 10 to 60 % (average 28 %)

Organic fields sequester 450 kg more atmospheric carbon per year than conventional. Mean difference in carbon stocks: 3.5 tons C per hectare

- Improved biological properties of soils (microbial biomass, microbial enzyme activities, abundance of earthworms, abundance of soil-dwelling insects: ranging from 40 to 120 %.
- Reduced nutrient losses

(Tuck SL, Winqvist C, Mota F et al., 2014)
Gerhardt, 1997; Clark et al., 1998; Brown et al., 2000; Pulleman et al., 2003; Pimentel et al., 2005; Marriott & Wander, 2006)
(Gattinger et al., 2012)
(Gerhardt, 1997; Siegrist et al., 1998; Hansen et al., 2001; Mäder et al., 2002; Pulleman et al., 2003; Fließbach et al., 2007, Pfiffner, L. and Luka, H., 2002.

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Strengths of organic farming

Organic farms are more profitable

- Organic farms 22 - 35 % more profitable
- Premiums: 29–32%
- Breakeven premiums necessary for organic profits to match conventional profits were only 5–7%

(Crowder & Reganold, 2015, dataset spanning 55 crops grown on five continents)

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Weakness of organic farming

Organic agriculture may have lower yields

- Yield deficits in temperate zones and intensive farming: range between -25 and -10 % (Seufert et al., 2012; De Ponti et al., 2012; Ponisio et al., 2015
- But compared to subsistence farming + 160 % (Hine et al., 2008)
- Wide range in crop yields
- Optimising farm income is more important than maximising single yields
- Organic systems more resilient than high-input, high-output systems
- Much of the agricultural land in Europe not suited to further intensification (Buckwell et al., 2014).

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Weakness of organic farming

Substantial gap in research support

- Globally, US$49 billion is annually spent for food and farming research (Beintema et al. 2012).
- Research compatible with organic farming probably far less than 1% of private and public R&D budgets (Rahmann et al. 2013; Titonell 2013; Niggli 2008).
- Innovation on organic farms is driven by farmers' own initiative and less by scientists and farm advisors.
- Lack of basic and applied research on organic farming systems limits its development

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Conclusions

- To achieve sustainable agricultural production systems, it is better to start from organic farming and enhance its productivity rather than starting with conventional farming and trying to reduce its negative impacts
- Clear possibility to improve farm yields by more research and better knowledge exchange
- Eco-functional intensification can enhance productivity and yield stability

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Conclusions

- Eco-functional intensification can strenghten ecological basis of organic and conventional farming
  - Redesign of farming systems instead of input substitution
  - Breeds and varieties adapted to low-input conditions
  - Better animal health and welfare
- Smart combination of agroecological knowledge and responsible use of modern technologies

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Conclusions

- 1 billion flagship programme for transition of food systems
  - re-design of policies
  - new farming systems
  - new supply chains
  - new knowledge and innovation systems

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Thank you for your attention !

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What is “Sustainable Agriculture”?

Dave Hughes
Global Head of Technology Scouting

TempAg Foresight Workshop
6th October 2016

Classification: PUBLIC

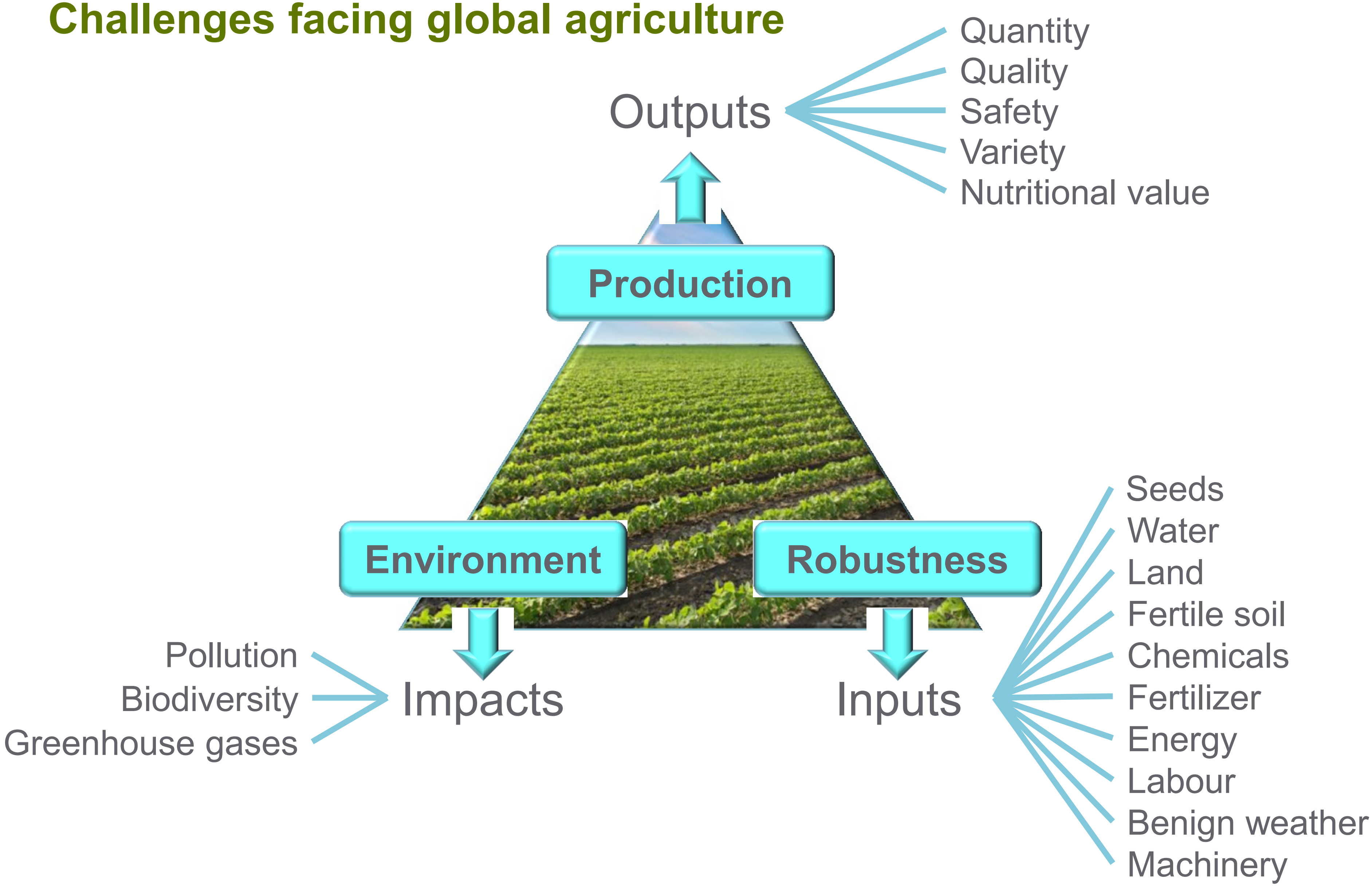
Talk outline

- Challenges facing global agriculture

- What is “sustainable agriculture” from an industrial perspective?
  - In the context of innovation

- [Hot areas for innovation in agriculture]

Challenges facing global agriculture



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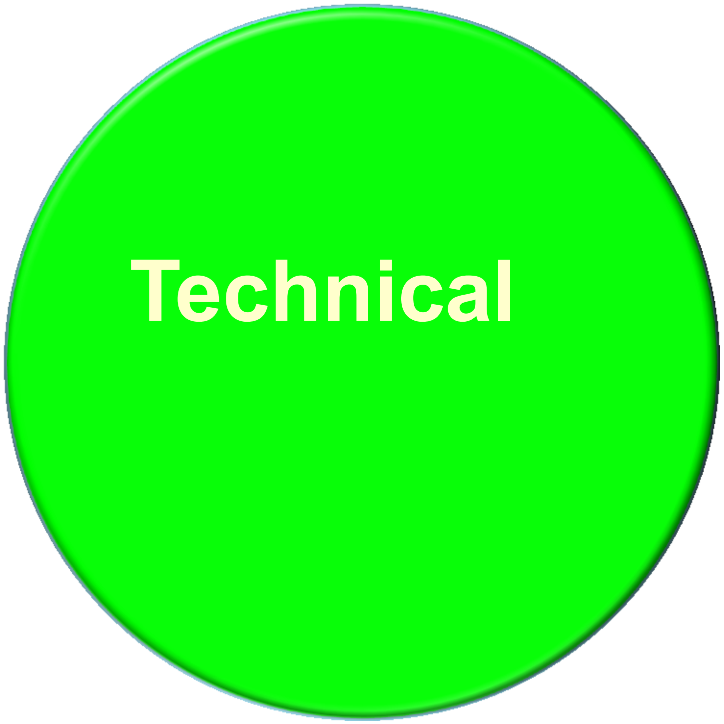
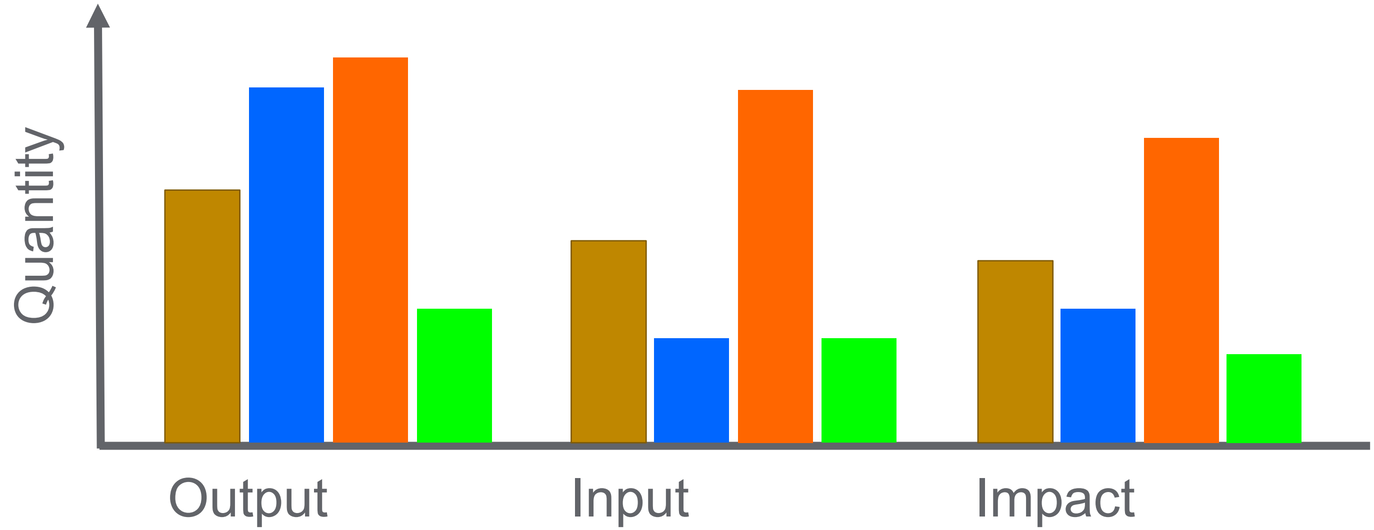
What is “Sustainable Agriculture”?



Technical sustainability – value generation



- Outputs: innovations that increase the value of the crop
  - Crop yield, crop “quality”
- Inputs: innovations that reduce reliance on inputs and/or reduce cost
  - Water, fertilizers, chemicals, labour, energy….
- Impacts: innovations that reduce damage to the wider environment
  - Pollution, greenhouse gases, biodiversity loss

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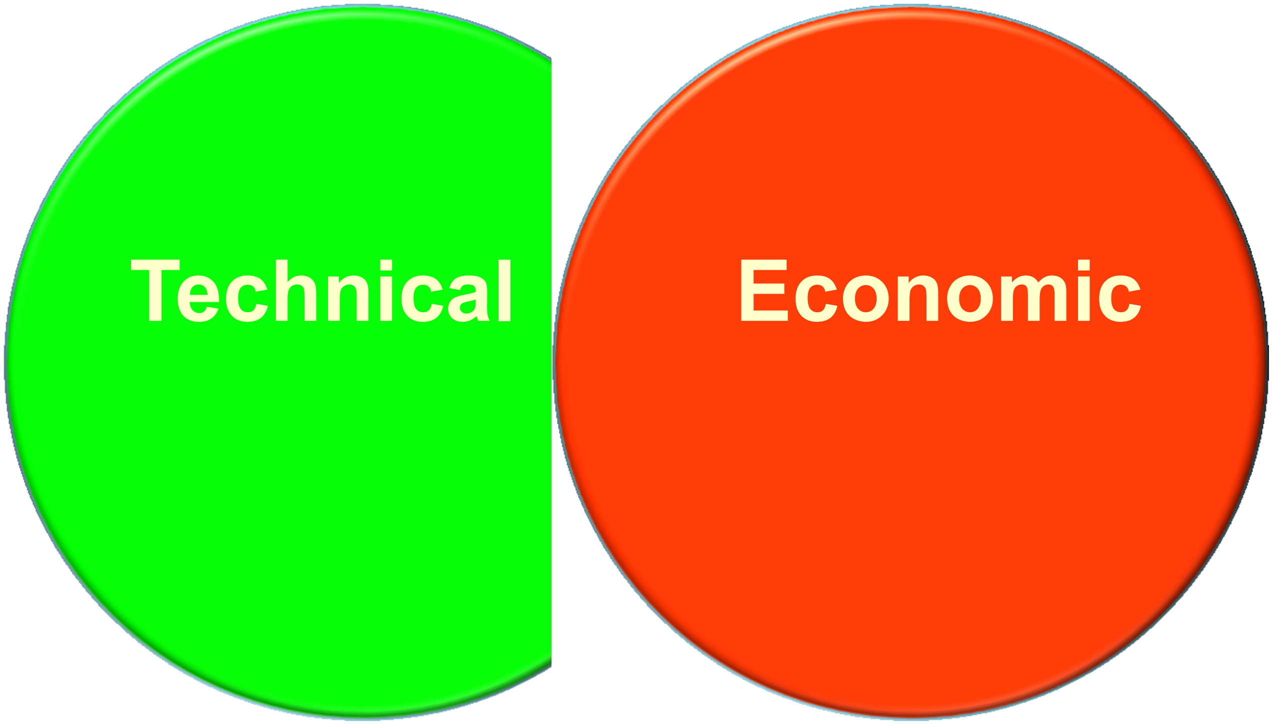
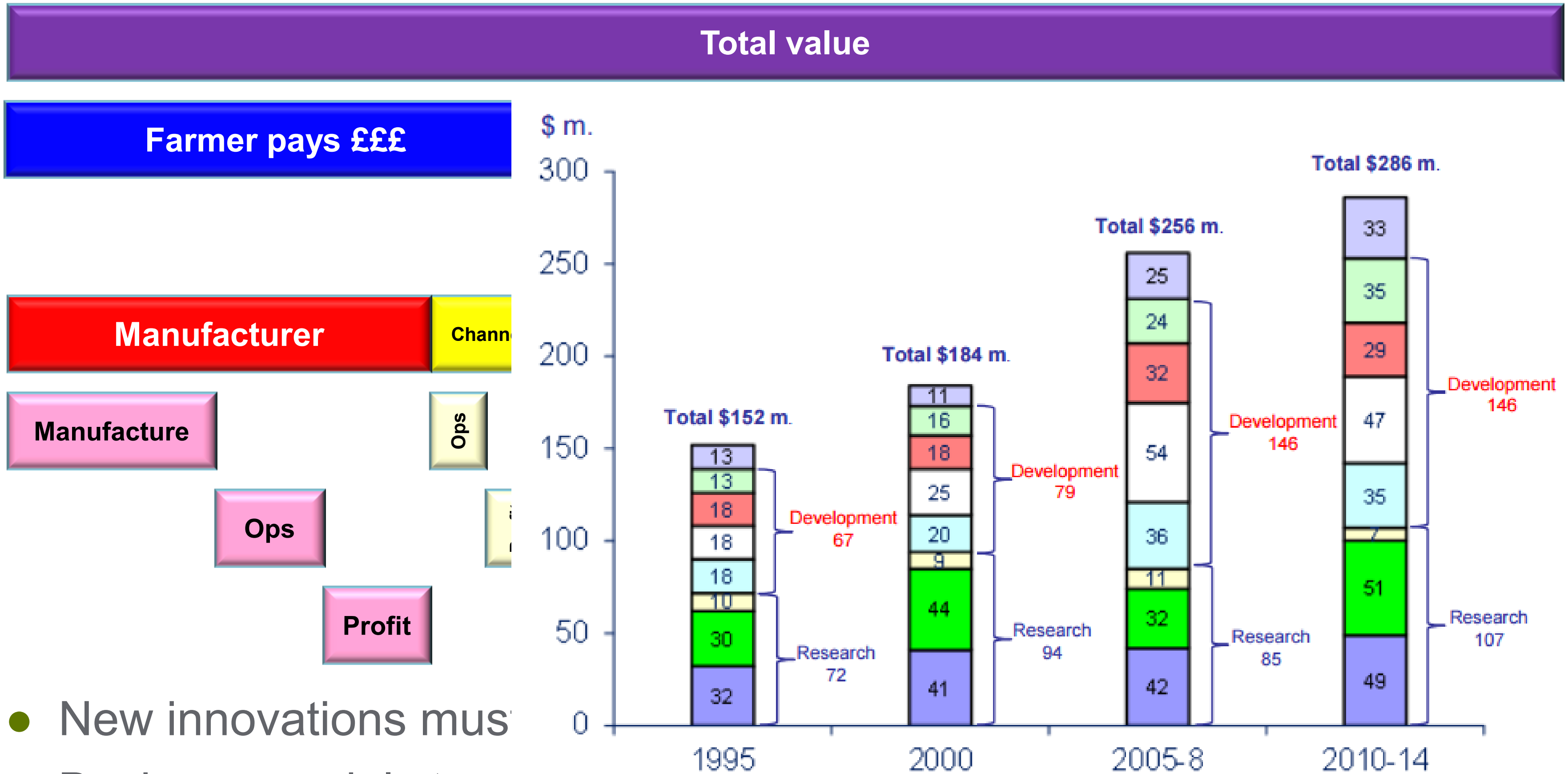
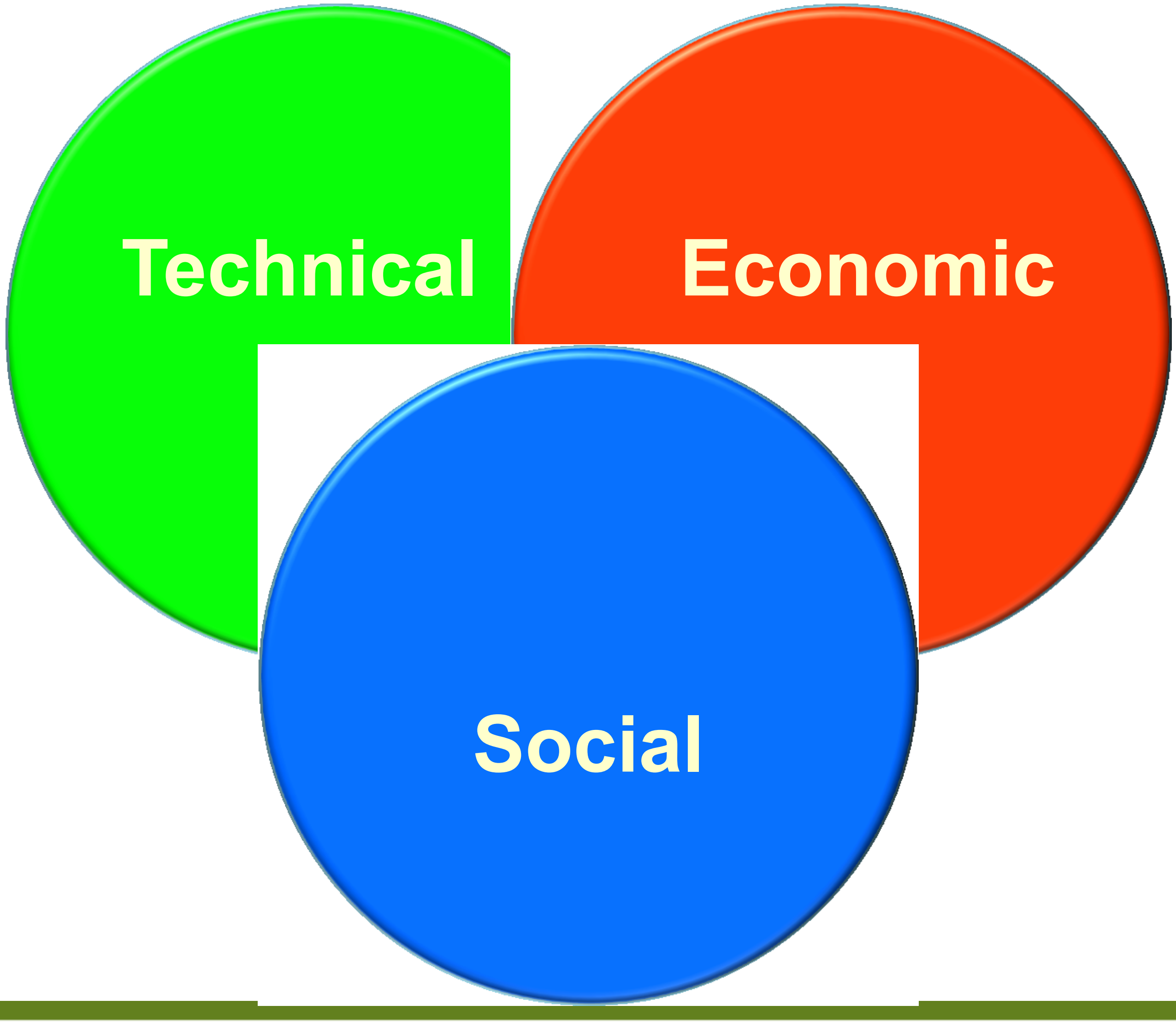


Economic sustainability – value capture

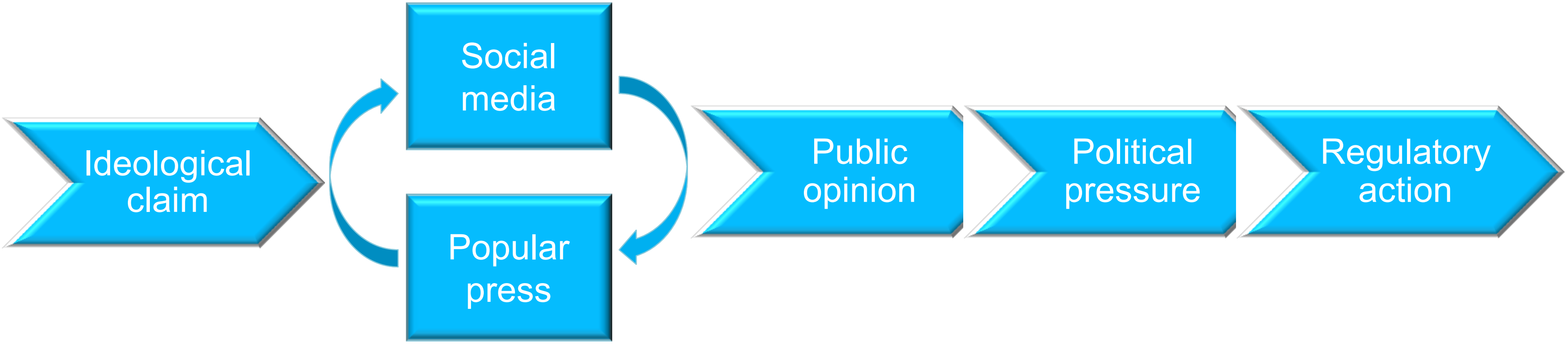


- New innovations mus
- Business models to recoup intangible value are often more problematic
- Incentives to innovate are being destroyed by excessive regulation
  - R&D costs ~ $300M; Annual sales ~ $100M; Annual profit ~ $20M

What is “Sustainable Agriculture”?



Social sustainability – societal acceptance



- Validation through repetition, experts and evidence easily dismissed
  - Outrageous claims simply fronted out when challenged
- Anti-technology rhetoric is widely accepted as "common sense"
  - "Big companies only interested in money, safety is unimportant"
    - Hence they cannot be trusted to adequately test their technologies
  - "Agriculture was far more sustainable in the old days"
    - Produced safer and tastier food in a more environmentally friendly way

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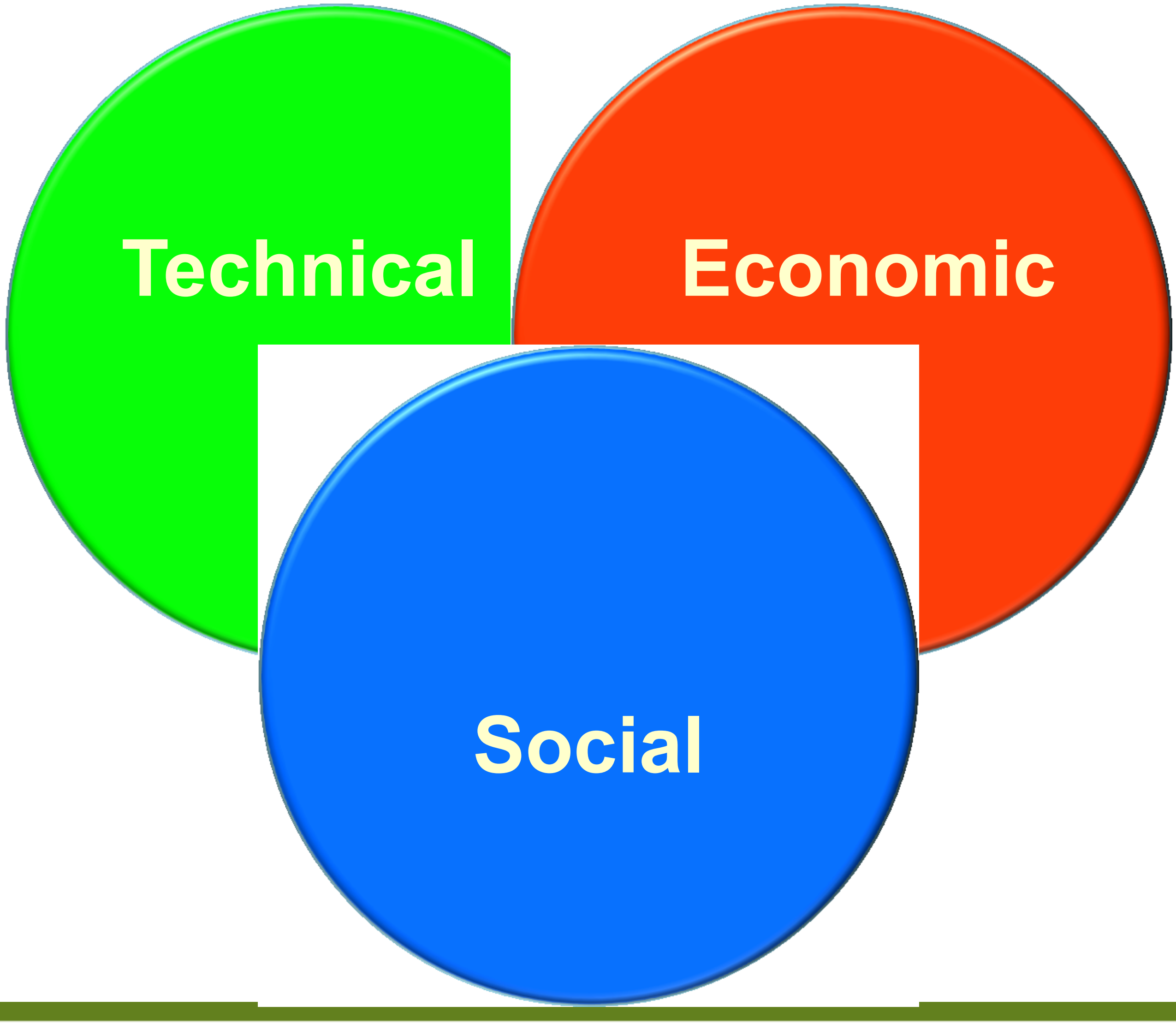
What is “Sustainable Agriculture”?



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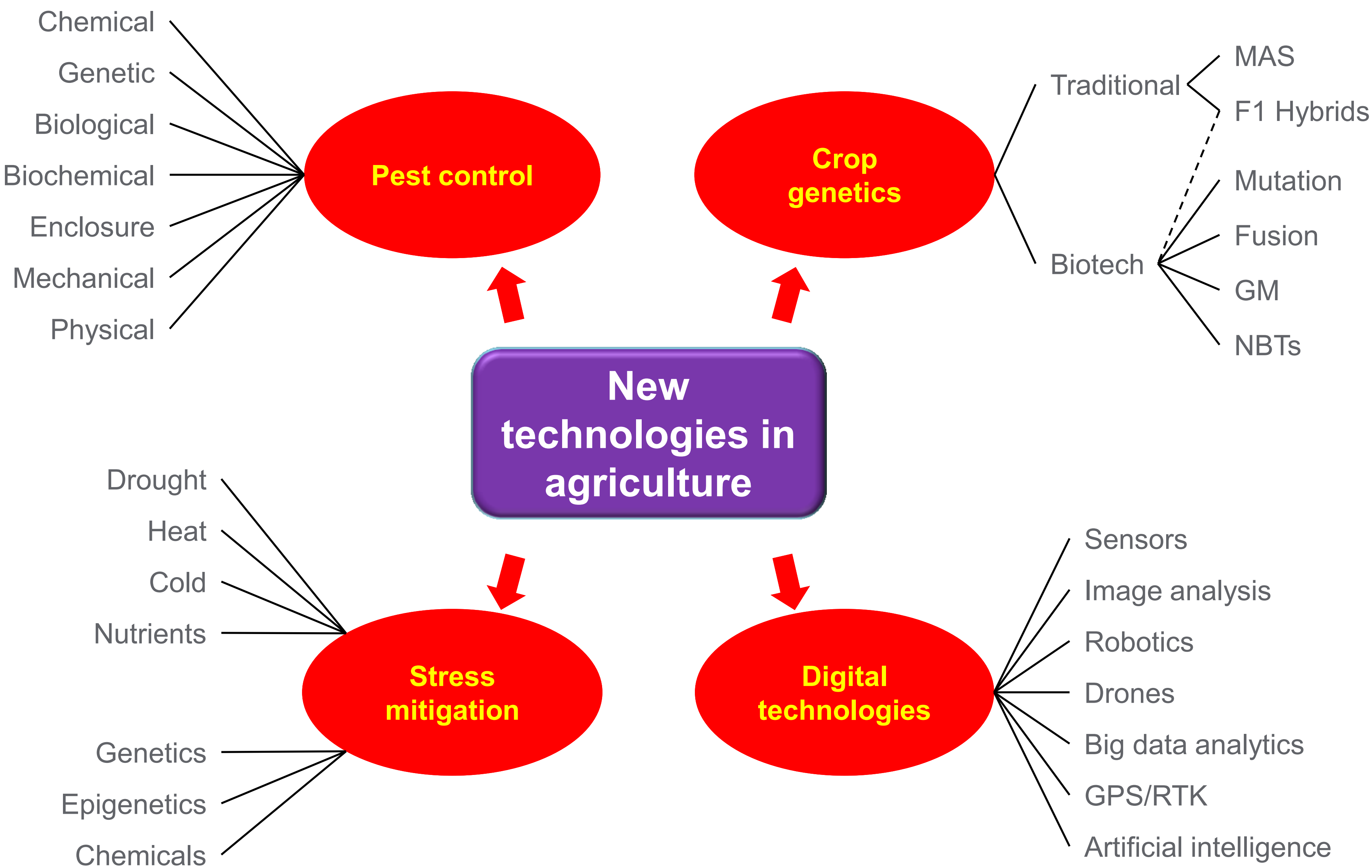
New technologies in agriculture
Pest control
Chemical
Genetic
Biological
Biochemical
Enclosure
Mechanical
Physical
Crop genetics
Traditional
MAS
F1 Hybrids
Biotech
Mutation
Fusion
GM
NBTs
Stress mitigation
Drought
Heat
Cold
Nutrients
Genetics
Epigenetics
Chemicals
Digital technologies
Sensors
Image analysis
Robotics
Drones
Big data analytics
GPS/RTK
Artificial intelligence