Priorities for the European R&D agenda with regard to sustainable intensification in dairy farming

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Structure of presentation

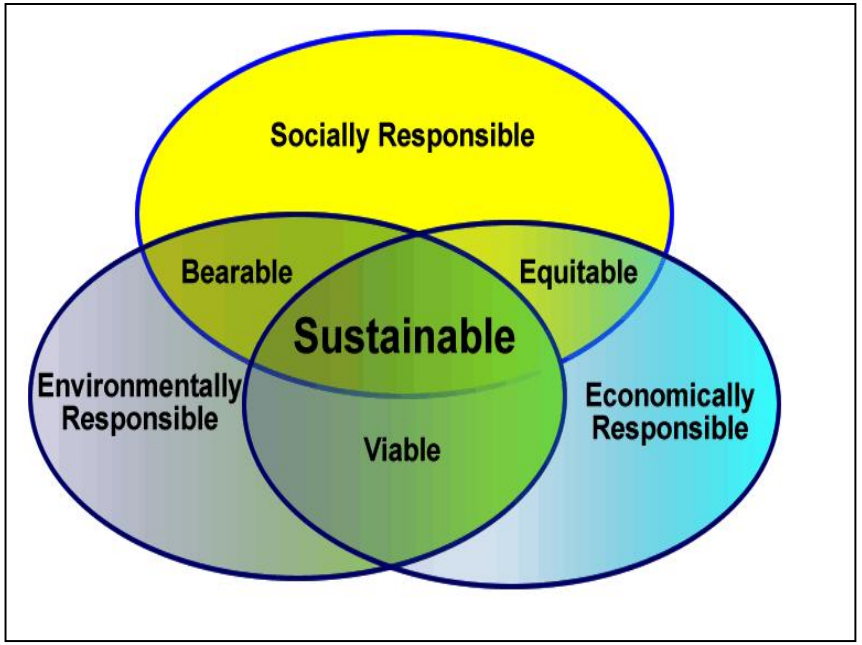
- Definitions and scope
- Drivers and challenges to the EU dairy industry
- Perspectives on sustainability
- Role of science and technology
- Priorities for research *and* development
- Summary and conclusions in re to sustainable intensification

Some definitions

‘Sustainable intensification’

- ‘producing more outputs with more efficient use of all inputs – on a durable basis – while reducing environmental damage and building resilience, natural capital and the flow of environmental services’ (Royal Society, 2009)
- i.e. producing more, while impacting less (on finite resources of fossil, fuel, fertiliser, water, land; on GHG emissions; eutrophication, biodiversity)

‘The 3 pillars of sustainability’



Priorities for ‘Research *and* Development (*and* Innovation)’

Societal challenges impacting on agriculture

- Food security
- Efficient resource use (incl. reducing waste)
- Environmental protection
- Climate change impact
- Socially acceptable systems of livestock production
- Economic development

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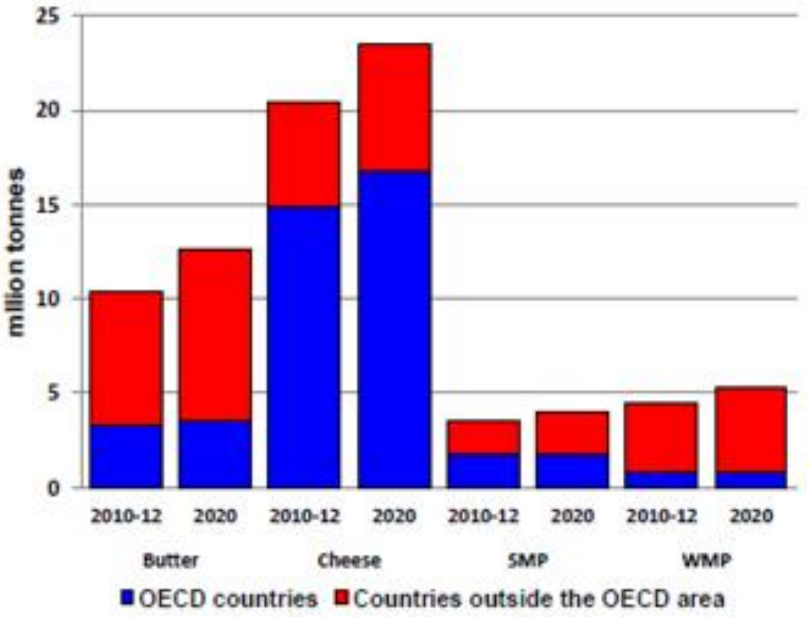
- Sustainable production and consumption

Global dairy markets (2010 -20)

- World trade to grow from 50m to 85m tonnes
- Demand expected to match or exceed production
- Consumption growth
  - < 1% in traditional markets (EU, Japan, Oceania)
  - 2% in North & Central Americ
  - 3% China, India & Sub-Sahara Africa
- Competitiveness, and purchasing power, will dictate EU potential to export



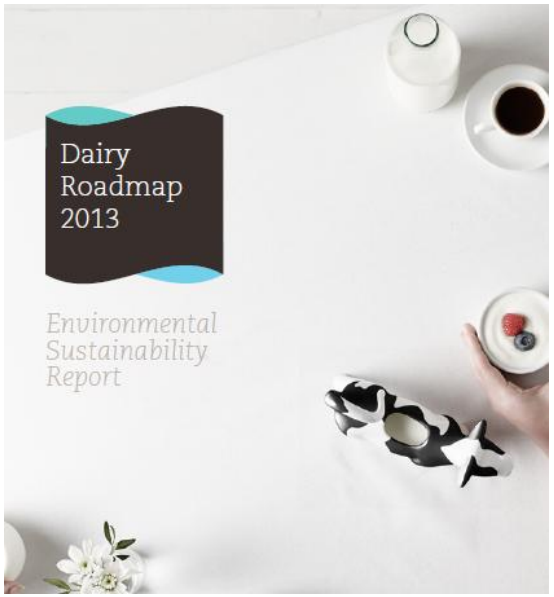
Source: OECD

Number of global middle class (m)	2009	2020	2030
N. America	338	333	322
Europe	664	703	680
Asia Pacific	**525**	1740	**3228**

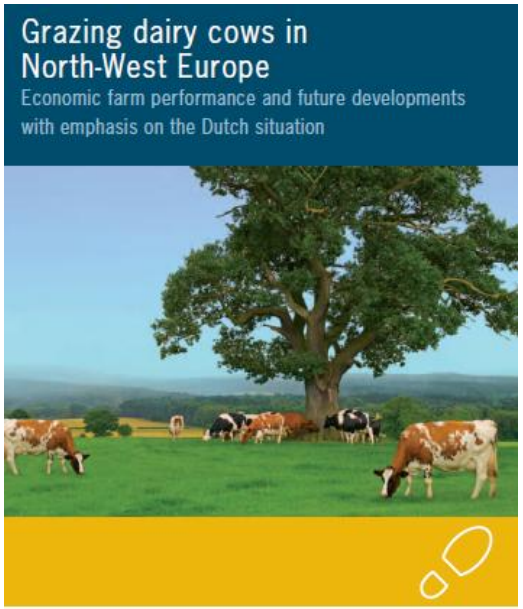
Not just supply – wider societal interest in….

Nutrition & health

Environmental impact



Production syste



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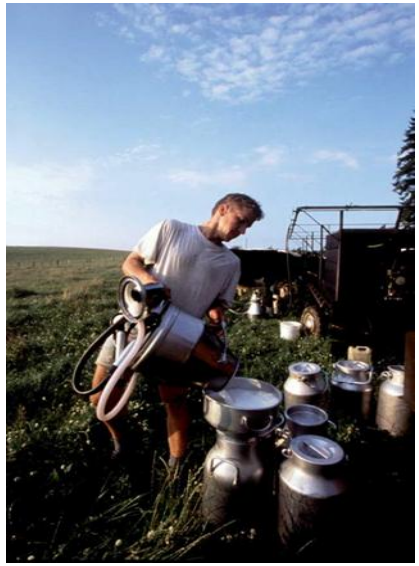
Scale and diversity in EU dairy farming (EU 27)

- 1.0 million dairy farmers
- 50 million hectares of land
- 23 million dairy cows
- 140 billion litres per annum
- 24% of total world dairy outpu

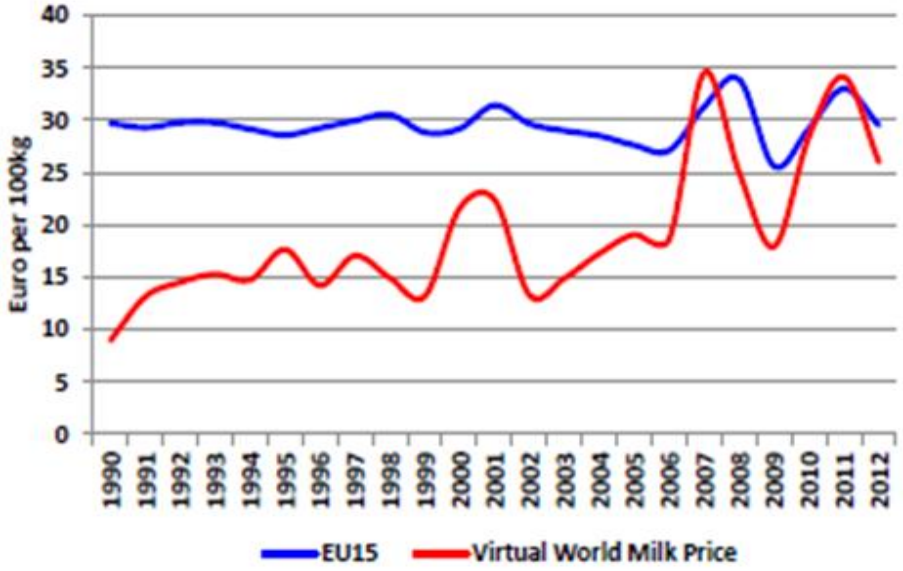
	Ireland	GB	Poland	Slovakia
Av. yield (l)	5365	7827	5075	6024
Av. herd size	55	137	4	164
No. of dairy farms	13100	14400	656500	1100



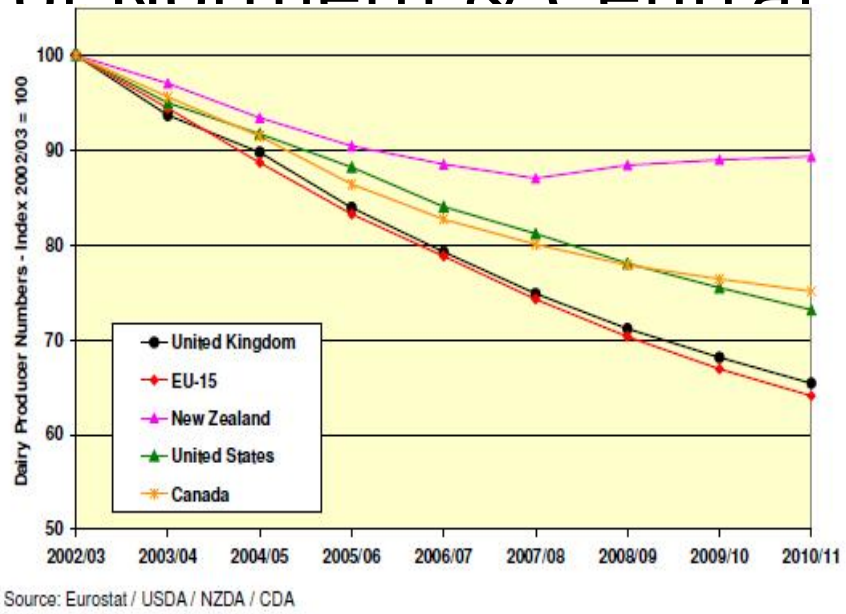
End of quota 2015

- Total EU output expected to grow by 2%-3% per annum
- Volatility in output (and input) prices will create pressure
- Significant differences between regions; mountain regions, areas of Northern & Central

Convergence of milk price

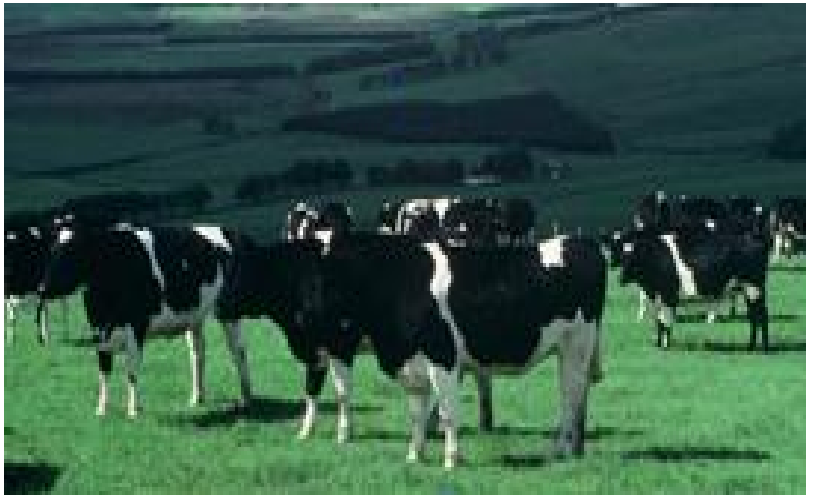


Long-term decline in farmer no



Source: Eurostat / USDA / NZDA / CDA

Contexts for sustainable dairy production



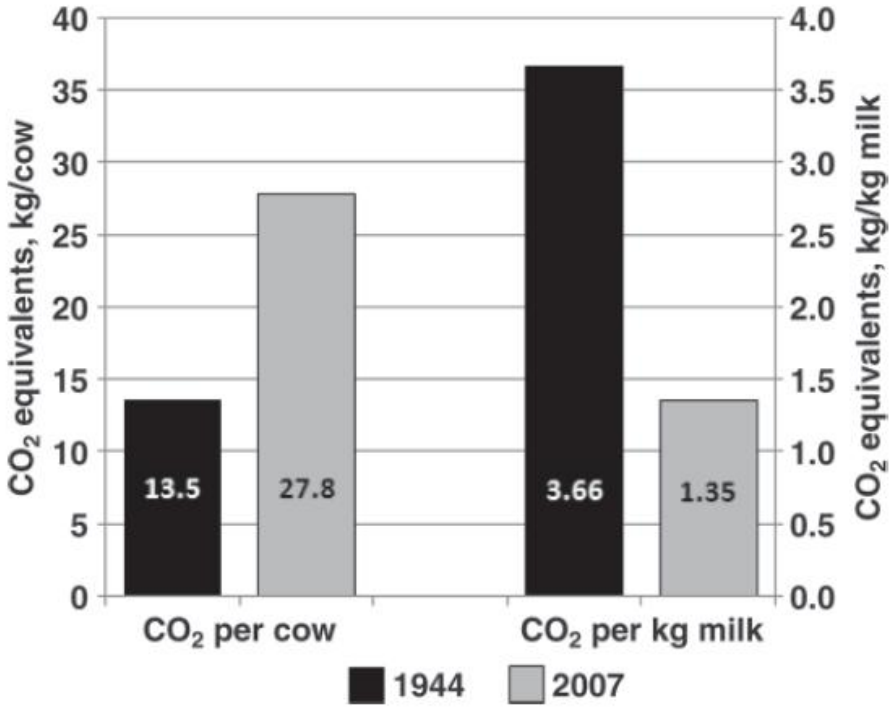
Land sparing vs land sharing (US dairy herd output 1944 vs. 2007)

Todays herd can produce 1b kg milk, with:-

- 21% of the animals
- 35% of the water
- 10% of the land

- 24% of the manure
- 43% of the methane
- 56% of the nitrous oxid

- 37% of the carbon foot print



(From Capper et al, 2009)

Carbon foot print of high performing grass-based & confined systems

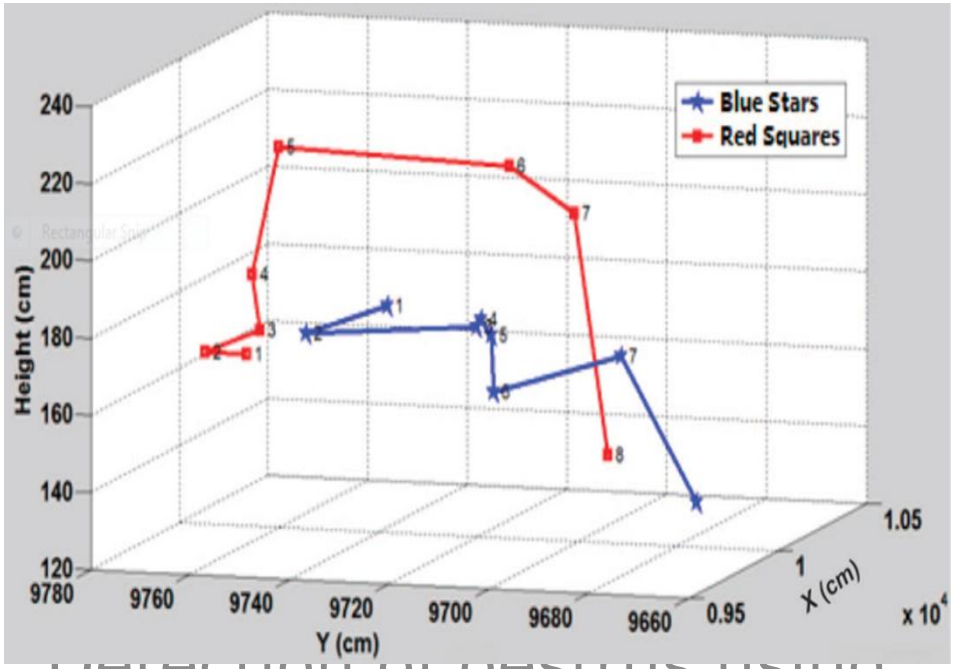
O' Brien et al, 2014	Grass based	Confined	
	Irish	UK	US
Milk production (kg per cow per year)	6262	10892	12506
Milk production (kg ECM per cow)	6695	10602	11650
Stocking rate (Livestock Units/ha)	2.53	3.74	2.79
Concentrate input (kg per cow per year)	320	2905	3355
CO_2 eq/t ECM – C sequestration included	857	884	898
CO_2 eq/t ECM – no C sequestration included	914	895	898

- With sequestration included, the grass-based system had 5%-7% lower C
- Top performing herds were 27%-32% lower in C footprint than average herds

Appliance of science

- Plant & animal genetics
- Precision agriculture
- Telemetry/sensing technology
- ‘Big data’
- Decision support tools

Also, the ‘appliance of sense’

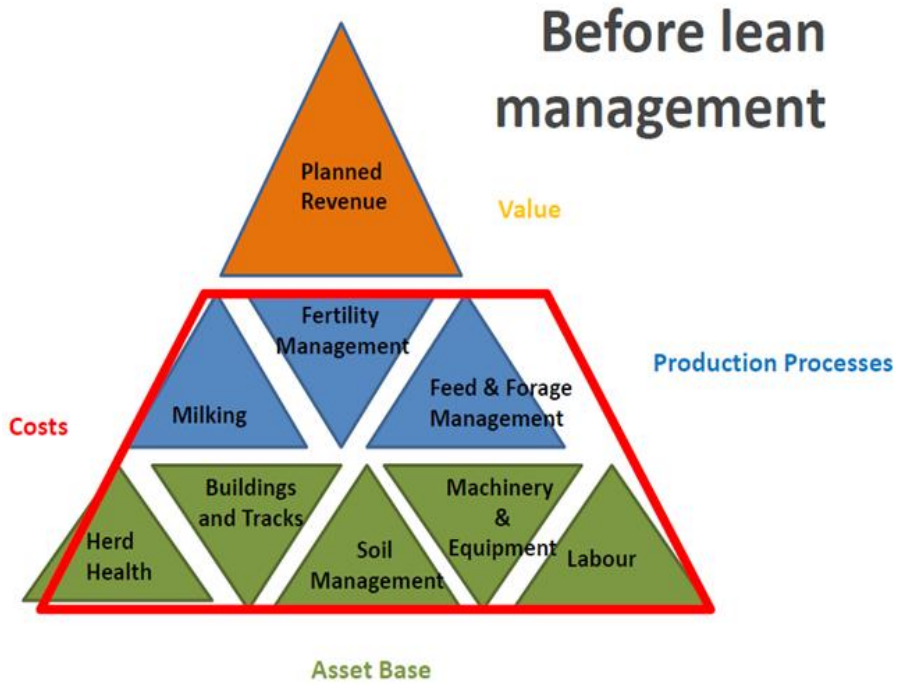


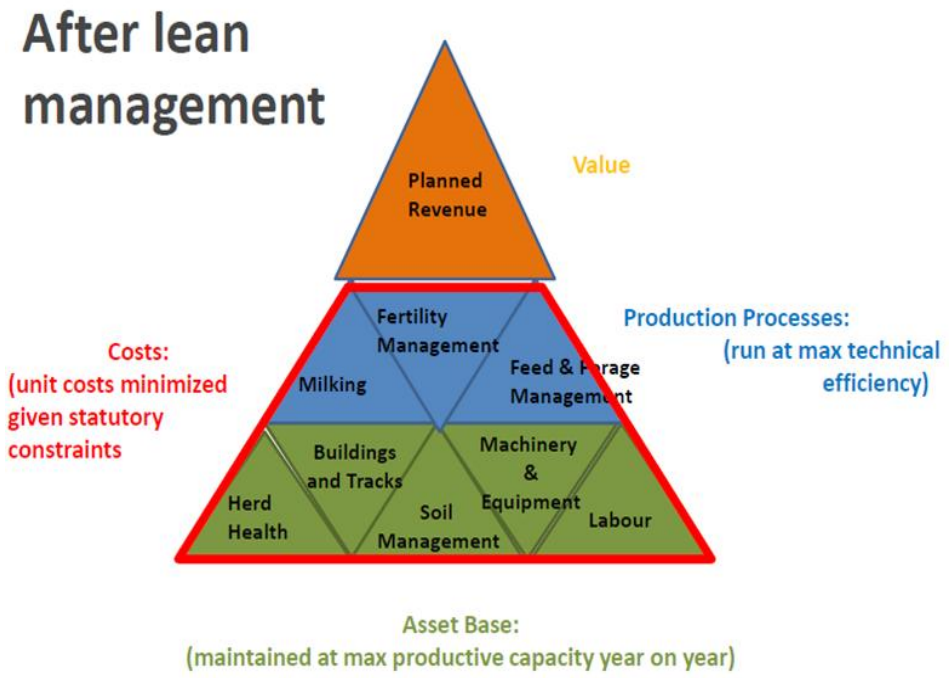
Detection of oestrus using ultra wide band technology

- Ensuring fundamentals
- Farm and system-specific solutions
- Key questions
  - context
  - application
  - and cost benefit

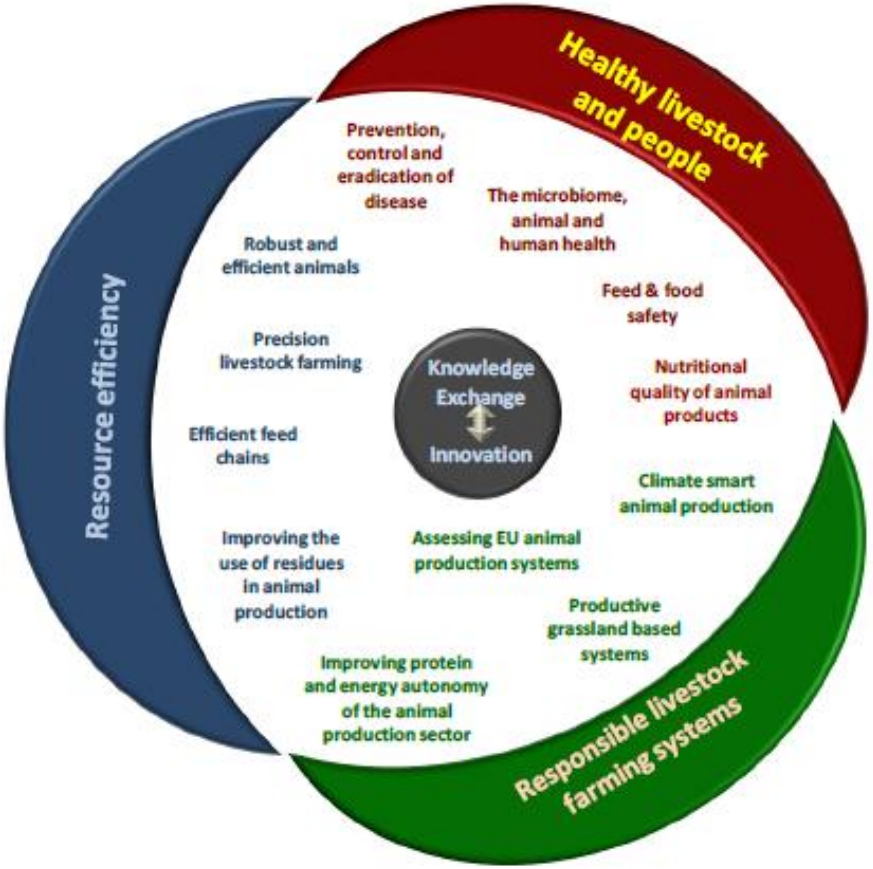
Appliance of better management approaches

- E.g. Dairy Lean Management
- Continuous improvements in production efficiency achieved through maximising value creation, and minimising generation of waste





Recommended R&D priorities – Animal Task Force



ATF White Paper, Apr. 13

1st Addendum, Nov. 14

Sustainable intensification – top 6 priorities for research and development

Efficient and resilient feed supply

- Autonomy in protein supply
- Greater exploitation of forage components in the diet
- Optimal use of co-products/non-human edible feedstuffs

Efficient, healthy animals

- Genetic improvement for fitness traits (fertility, longevity, disease resistance/resilience)
- Feed efficiency (adapted to system and type of diet)

Sustainable intensification – top 6 priorities for research and development

Nutrient management (encompassing soil health)

- Improved nutrient management, recovery and delivery systems
- Plant breeding for improved nutrient efficiency

Further development of robust LCA methodologies

- Sustainability characteristics and outcomes of different methods of production
- Valorise ecosystem services from diverse production systems

Sustainable intensification – top 6 priorities for research and development

Consumer-friendly production systems

- Design of housing systems to better meet cow comfort and behavioural needs

Socio-economic traction

- New business models to improve infrastructure & facilitate entry of younger generation into dairying
- Tools and tactics to increase farm resilience to climate and/or economic shock
- Data & systems to increase visibility on local issues & priorities to influence behaviour on sustainable production

Summary and conclusions

- Competitiveness, improved resource efficiency, environmental performance and social responsibility key to a sustainable future for dairy farming in Europe
- ‘Sustainable intensification’ is compatible with these goals – when interpreted in its widest context
- Mixed delivery model needed to take account of regional structural, environmental and socio-economic differences
- R&D can provide understanding of biological processes, enabling technologies and technical innovations