The boundaries to be applied in life cycle analysis

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This presentation

- Highlight the value of LCA before...
- ...discussing some concerns about LCA
  - Technical boundary issues
  - Conceptual boundary issues
- Illustrate these through some scenarios
- Main focus on livestock

The value of LCA

- *"Common sense is the sense that tells you that the earth is flat"* (variously attributed)

- The food miles issue (but more later)
- Importance of livestock

What LCA tells us about livestock

- Most GHG intensive food category (on the whole) - as measured using a range of functional units.
- Most meat and dairy GHG impacts occur at the farm stage
- Dominant gases are methane and nitrous oxide - CO_2 from energy use less important (although significant for IP & PUs)
- Beef and sheep meat most GHG intensive. Pigs better. Poultry products best.

What LCA doesn't say

- Much about land quality and land use change (**practical** boundary problem and qualitative issue too)
- How things might be different if the socio-ethical context were different – **conceptual** boundary problem
- This has implications for the policies and actions taken to mitigate livestock emissions

PRACTICAL: Land use and LCA

- Good chickens and bad cows – why?
  - Ruminants produce methane
  - Poor feed conversion efficiency

  } linked

  - Long time growing producing nothing edible
- But the way they use land differs
  - Pigs and poultry are less land intensive than ruminants
  - This can be a **good** or a **bad** thing depending on the ruminant system you're comparing it with...
  - ... and the land type & how it's being managed
- Also resource efficient (fibrous byproducts)

Land use and pigs & poultry

- **Intensive pigs and poultry systems** are apparently landless
- But they consume cereals and soy grown on land, so they're not
- P&P feed production competes with food production for land
- Land is scarce – LUC often results = CO_2 release
- **Alternative system**: p&p only on byproducts – outputs much lower but would be resource efficient (p&p can't cope with too much fibre)

Land use and intensive ruminant production

- **Intensive systems**:
  - depend on grains and oilseeds – land / grains could be used to feed humans
  - Use lots of land
  - Feed conversion low (much 'wasted' as methane and nitrogen)
  - **Triple whammy**
- Although some carbon sequestration in some intensive systems and ruminants make use of byproducts

Ruminants and land - extensive

- **Extensive systems** make use of marginal land unsuited to other forms of cultivation
  - Can help sequester carbon (properly managed) plus ecosystem services – free up good quality land for other uses
  - Can lead to carbon losses (overgrazing, poor mgt)
  - Productivity lower (meat / milk) so relative methane intensity higher
  - So the **quality** of land use is an issue
- But rearing same numbers on 'better' land and inputs (or on forest) would mean land use change and competition with good land for food arable production
- Uplands could be used for biomass.... Aesthetics?

Knowledge gaps grow as boundaries widen

- For example:
- LU change drivers are complex & change over time eg. Amazon: cattle, slash & burn, soy, timber, infastructure devt...) – what's the baseline soil carbon and how to allocate emissions?
- Emission factors vary by feed – difficult to get good data on what's fed
- Ultimate boundaries are potentially very wide – eg. human life and reproduction

CONCEPTUAL boundary issues

- LCA has little to say about
  - Absolute quantities – our **need** vs **demand** for animal source foods (nutritionally, or in terms of equitable distribution)
  - Or the effects of different systems on **animal welfare**
  - The role of livestock in **sequestering carbon**
  - Or the role of livestock as **part of the environment** as opposed to an environmental problem to be squeezed to a minimum

How does all this affect the mitigation options?

Mainstream options:

- Improve productivity (more for less)
- Switch from red to white
  - less CH_4
  - better feed conversion
  - less land compared with ruminant systems
- All ok within the context of:
  - No limits to growth; no ethical non-negotiables; no biodiversity goals; no differentiation between land types

But …
What if things were different?

- How do the GHG impacts of different livestock systems look when we adopt different definitions of:
  - Human nutritional needs
  - Animal welfare
  - Biodiversity
  - ‘Suitability’ of land uses?

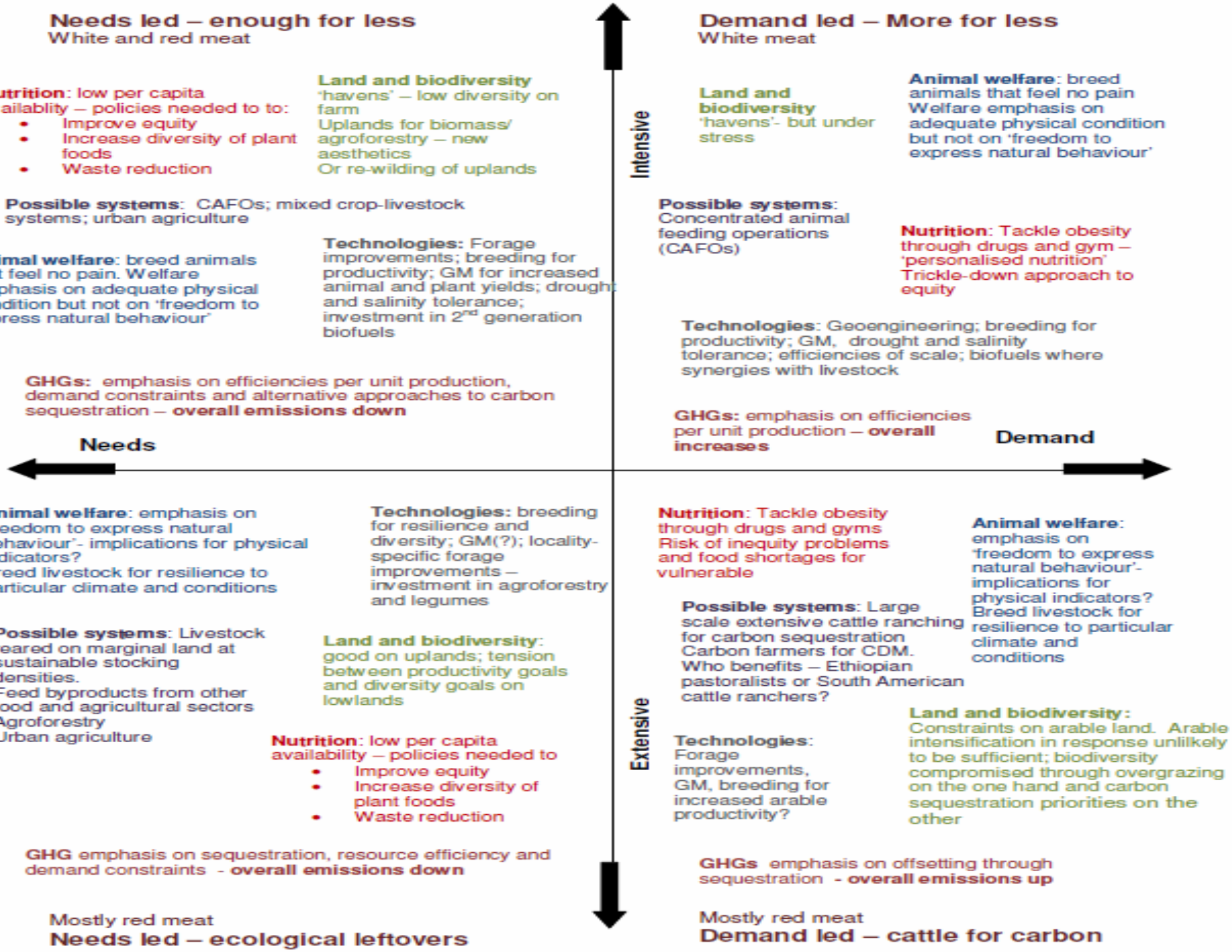
- 4 scenarios...

4 scenarios – different variables (put simply)

- Absolute versus relative **needs**
  - Emissions per kg product **wanted** vs emissions per nutritional **need** fulfilled
- Absolute versus relative **emissions**
  - Emissions per kg **product** vs emissions per area of **land** available
- Absolute versus relative **ethics**:
  - ASF: Physical **supply** versus equitable **distribution**
  - Animals: **intrinsic** value versus extrinsic **utility**
  - Biodiversity: **agroecology** vs biodiversity **havens** + differences in how we assign value to diversity

For each scenario

- What are the possible implications for GHG emissions?
- And for:
  - Human nutrition
  - Animal welfare
  - Biodiversity and ideas about land use?
- And what approaches might be taken to tackle negative impacts?


Needs led – enough for less
White and red meat
Nutrition: low per capita availablity – policies needed to to:
Improve equity
Increase diversity of plant foods
Waste reduction
Land and biodiversity
'havens' – low diversity on farm
Uplands for biomass/ agroforestry – new aesthetics
Or re-wilding of uplands
Possible systems: CAFOs; mixed crop-livestock systems; urban agriculture
Animal welfare: breed animals that feel no pain. Welfare emphasis on adequate physical condition but not on 'freedom to express natural behaviour'
Technologies: Forage improvements; breeding for productivity; GM for increased animal and plant yields; drought and salinity tolerance; investment in 2nd generation biofuels
GHGs: emphasis on efficiencies per unit production, demand constraints and alternative approaches to carbon sequestration – overall emissions down
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Trickle-down approach to equity
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GHGs: emphasis on efficiencies per unit production – overall increases
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Animal welfare: emphasis on 'freedom to express natural behaviour'- implications for physical indicators?
Breed livestock for resilience to particular climate and conditions
Technologies: breeding for resilience and diversity; GM(?); locality-specific forage improvements – investment in agroforestry and legumes
Possible systems: Livestock reared on marginal land at sustainable stocking densities.
Feed byproducts from other food and agricultural sectors
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Risk of inequity problems and food shortages for vulnerable
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Possible systems: Large scale extensive cattle ranching for carbon sequestration
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Who benefits – Ethiopian pastoralists or South American cattle ranchers?
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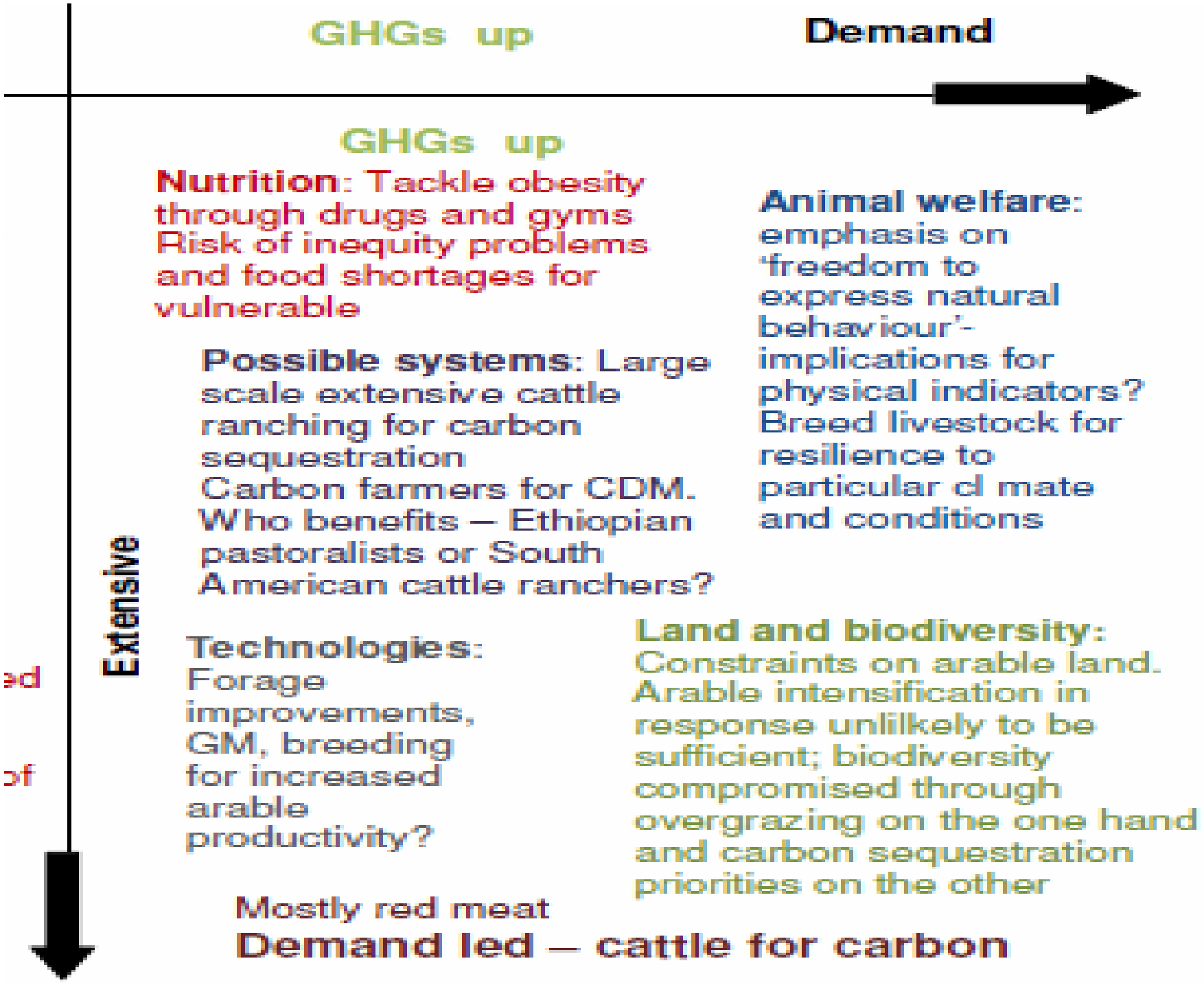
Demand led – more for less

- GHG implications: Relative reductions in GHG emissions – absolute **growth**
- Animal welfare compromised
- Double burdens of over and undernutrition not necessarily addressed
- Biodiversity eroded and possibly ‘redefined’ as demand increases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- GHG emissions: carbon sequestration will not offset deforestation – emissions **up**
- Animal welfare compromised where overgrazing
- Human nutrition compromised – insufficient grain supply
- Biodiversity losses – land converted to pasture

Needs led – enough for less

White and red meat

Nutrition: low per capita availablity – policies needed to to:

- Improve equity
- Increase diversity of plant foods
- Waste reduction

Land and biodiversity

'havens' – low diversity on farm

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Or re-wilding of uplands

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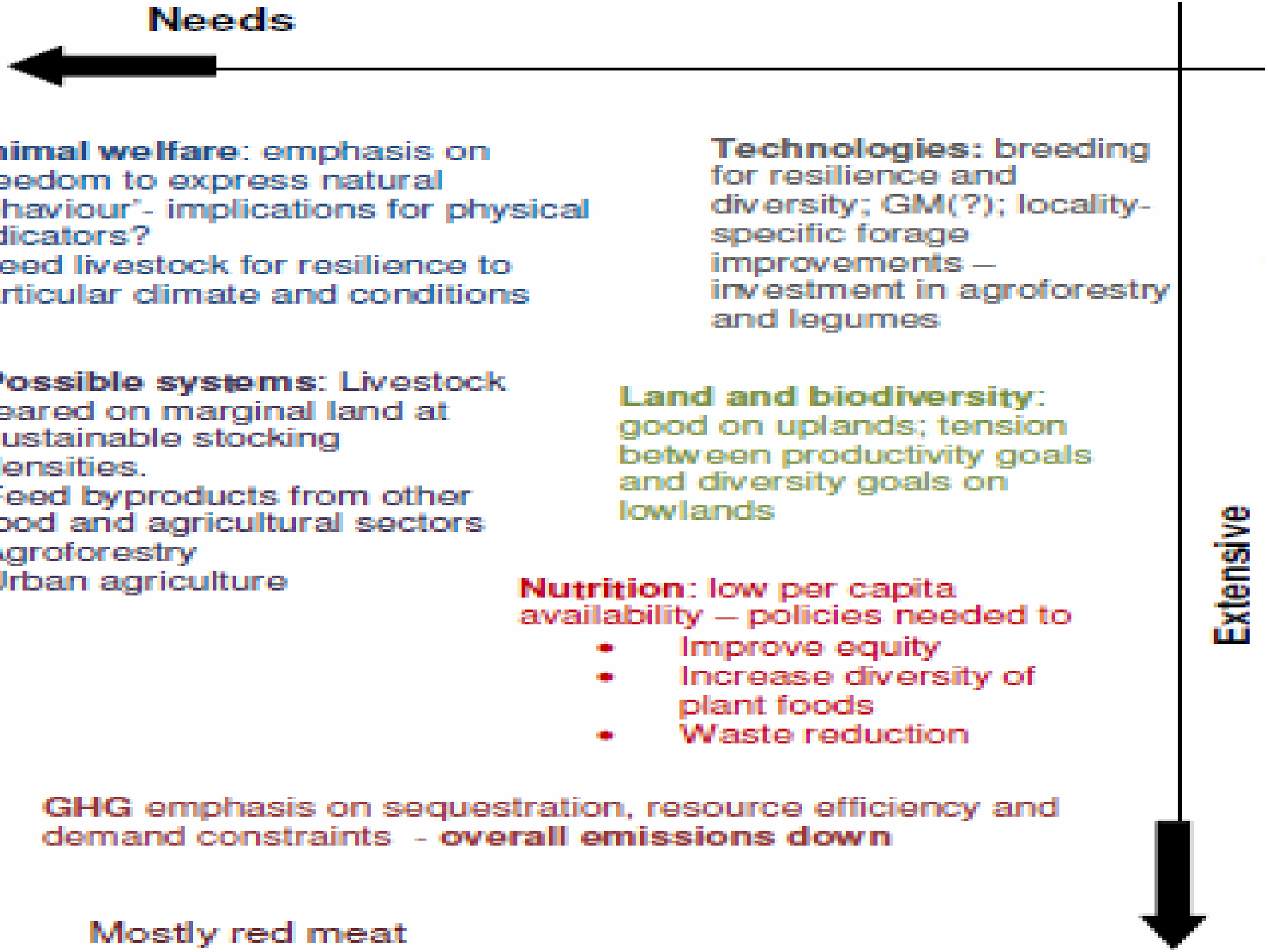
GHGs: emphasis on efficiencies per unit production, demand constraints and alternative approaches to carbon sequestration – **overall emissions down**

Intensive

Needs

Needs led – enough for less

- Relative reductions in GHG emissions; absolute **reductions** through demand constraints
- Animal welfare – compromised
- Biodiversity: mixed – poor in farmed areas but biodiversity havens
- Human nutrition: emphasis on equitable distribution means that prospects could be good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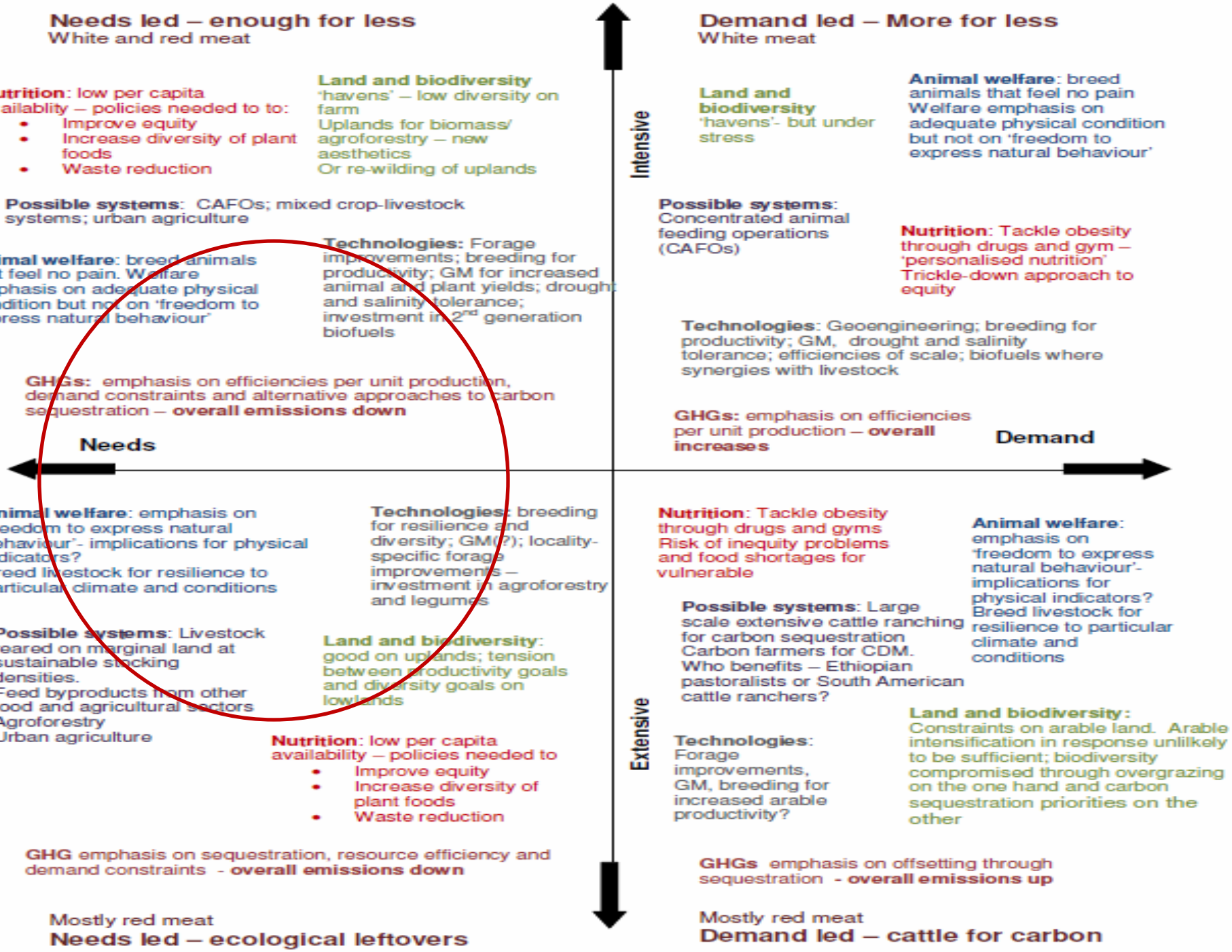
- GHG emissions: GHG intensity unclear – carbon sequestration on the one hand, but higher methane on the other; absolute emissions **reduced** through demand constraints
- Biodiversity: good – intensive arable production and maintenance of diversity in uplands; land use change avoided
- Nutrition: adequate if strong focus on equity plus investment in diversified crop production
- Animal welfare: good for ‘natural behaviour’ – physiological welfare requires careful management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What are the implications for LCA?

- We need LCA**+**
- **+** Qualitative and quantitative assessment of land use
- **+** Imagination and a synthetic, integrative approach to the challenges we face

And finally... food miles

- Is shorter better?
- LCA has shown that ‘not necessarily’
- BUT it doesn’t say **why** people worry about food miles.
- Disruption of unities of: time, place, agency

The food system is now...

- ...Out of time (refrigeration – time capsule)
- ...Out of place (globalised supply)
- ...Out of our agency (we don't know about food any more)
- The food miles concern reflects our dis-ease with the system and our lost engagement from the environment
- Food miles says something 'true' about our desire for reconnection

Thank you

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