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The role of animal research to support a climate smart, sustainable nutrition security in a circular bioeconomy

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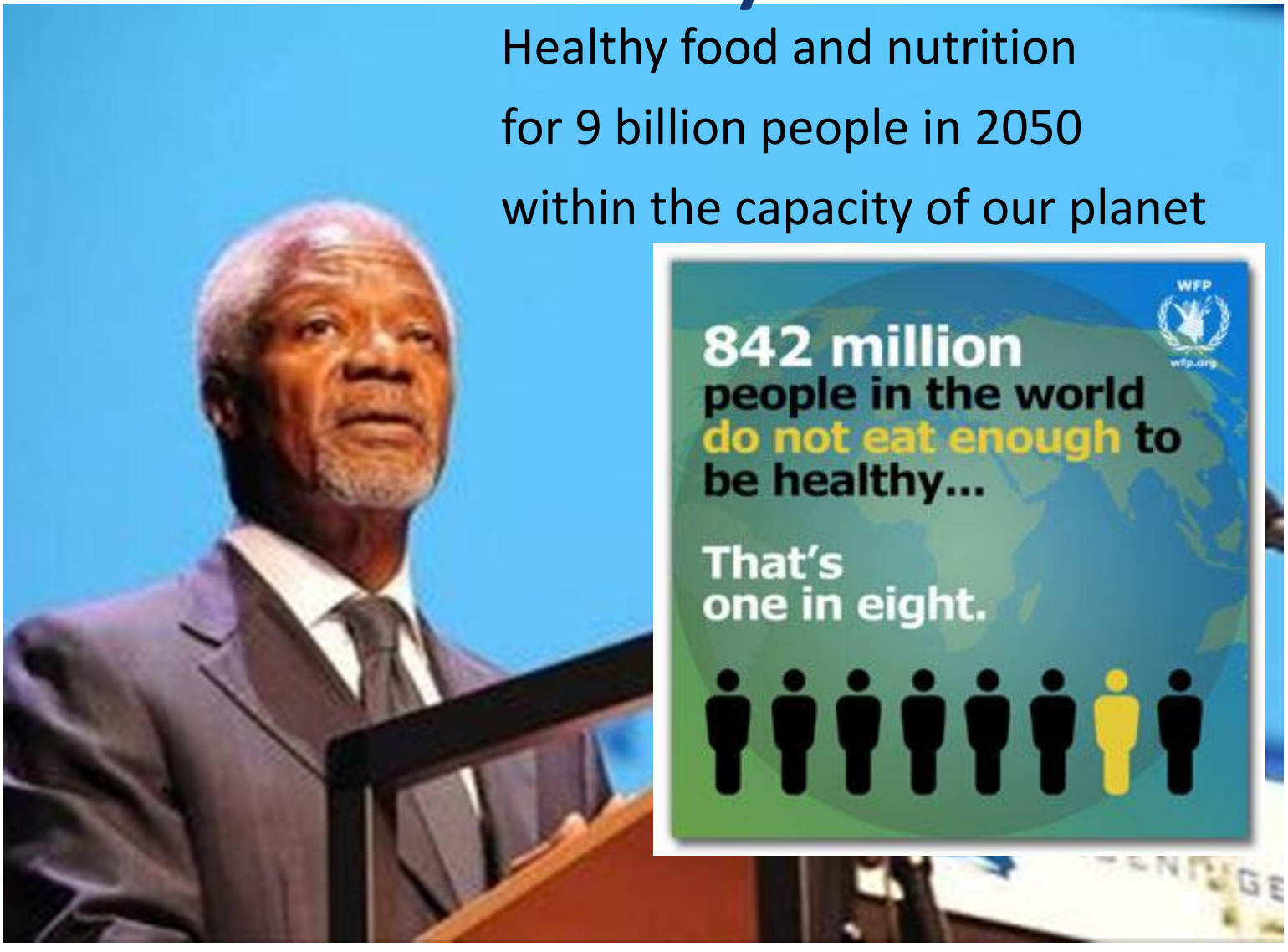
Global Nutrition Security

Healthy food and nutrition

for 9 billion people in 2050

within the capacity of our planet



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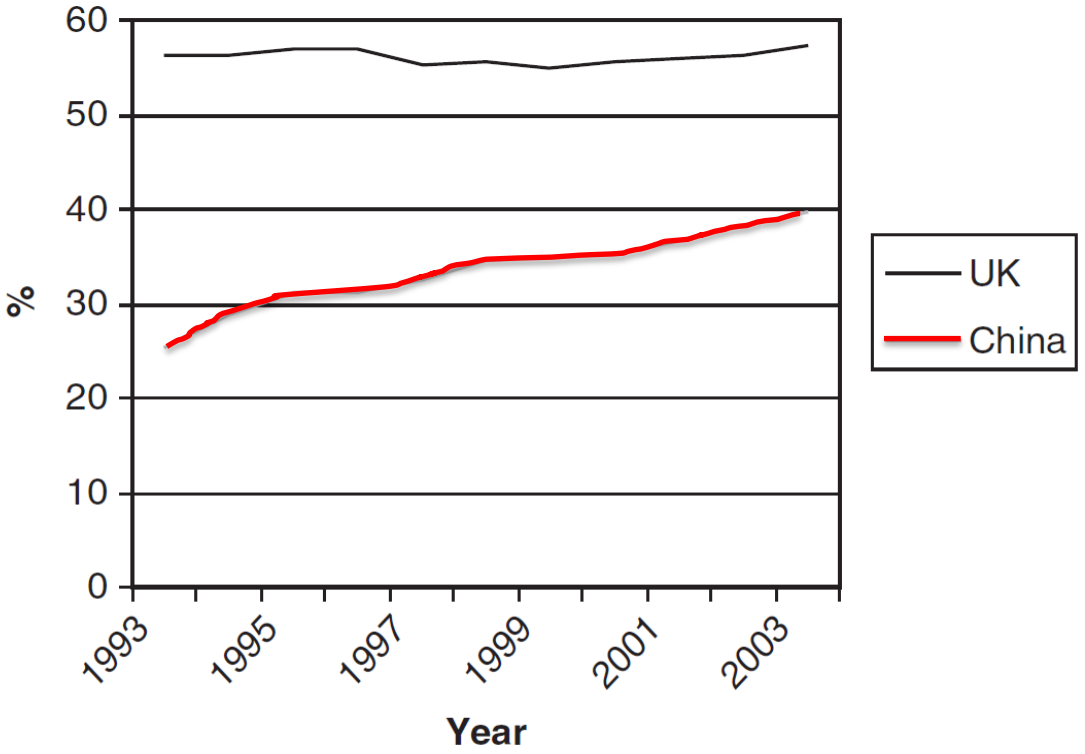
Consumption of animal protein



Animal protein consumption as a % of total protein consumption (FAOSTAT, 2008)

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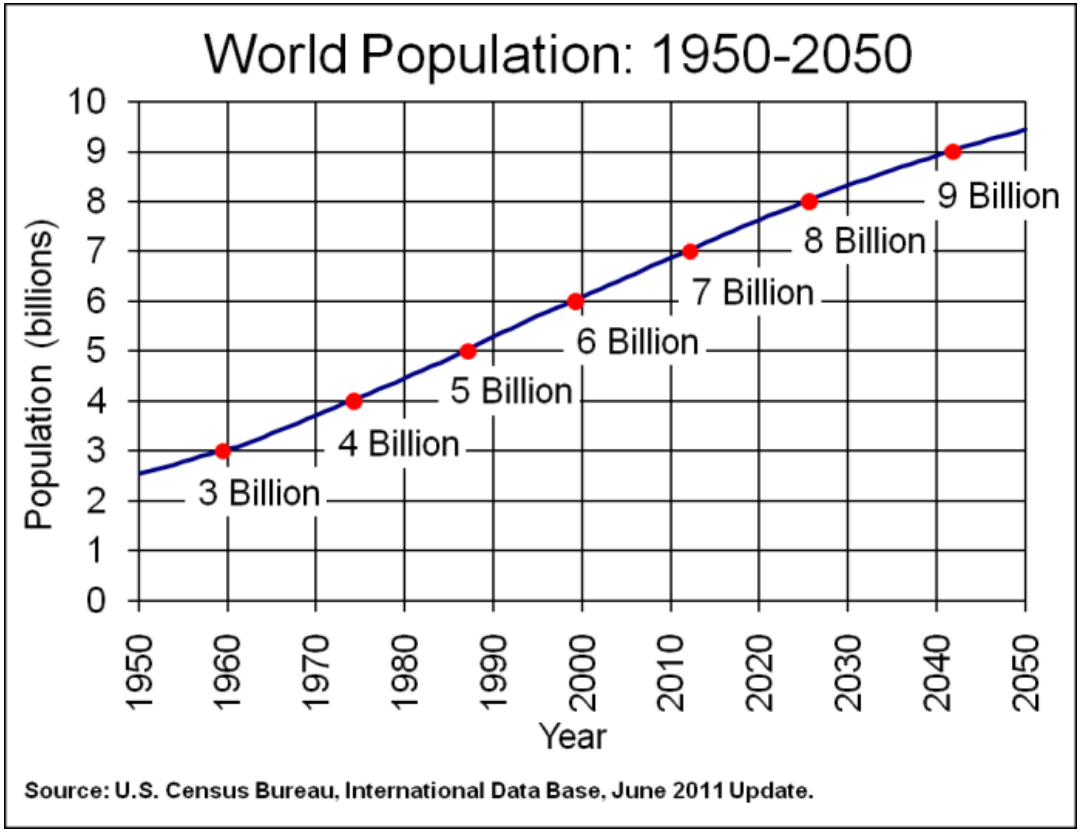
Perspective of Livestock production 2050



Food Demand

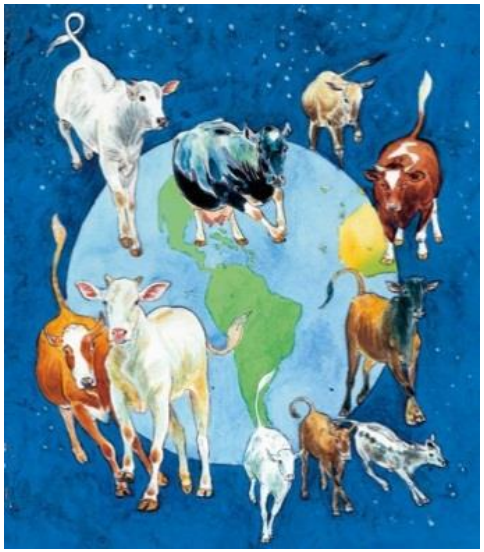
Meat: + 70% (465 Mt)

Milk: + 60% (1045 Mt)

Eggs: + 60% (110 Mt)

Why livestock are so important?

- Convert raw biomass (grass, crop residues, by-products) to food
- Utilise marginal land
- Contribute to biomass cycling
- Reduce use of mineral fertilisers
- Serves ecosystem functions
- Animal products with high nutritional value
  - Proteins/amino acids
  - Fatty acids
  - Highly digestible



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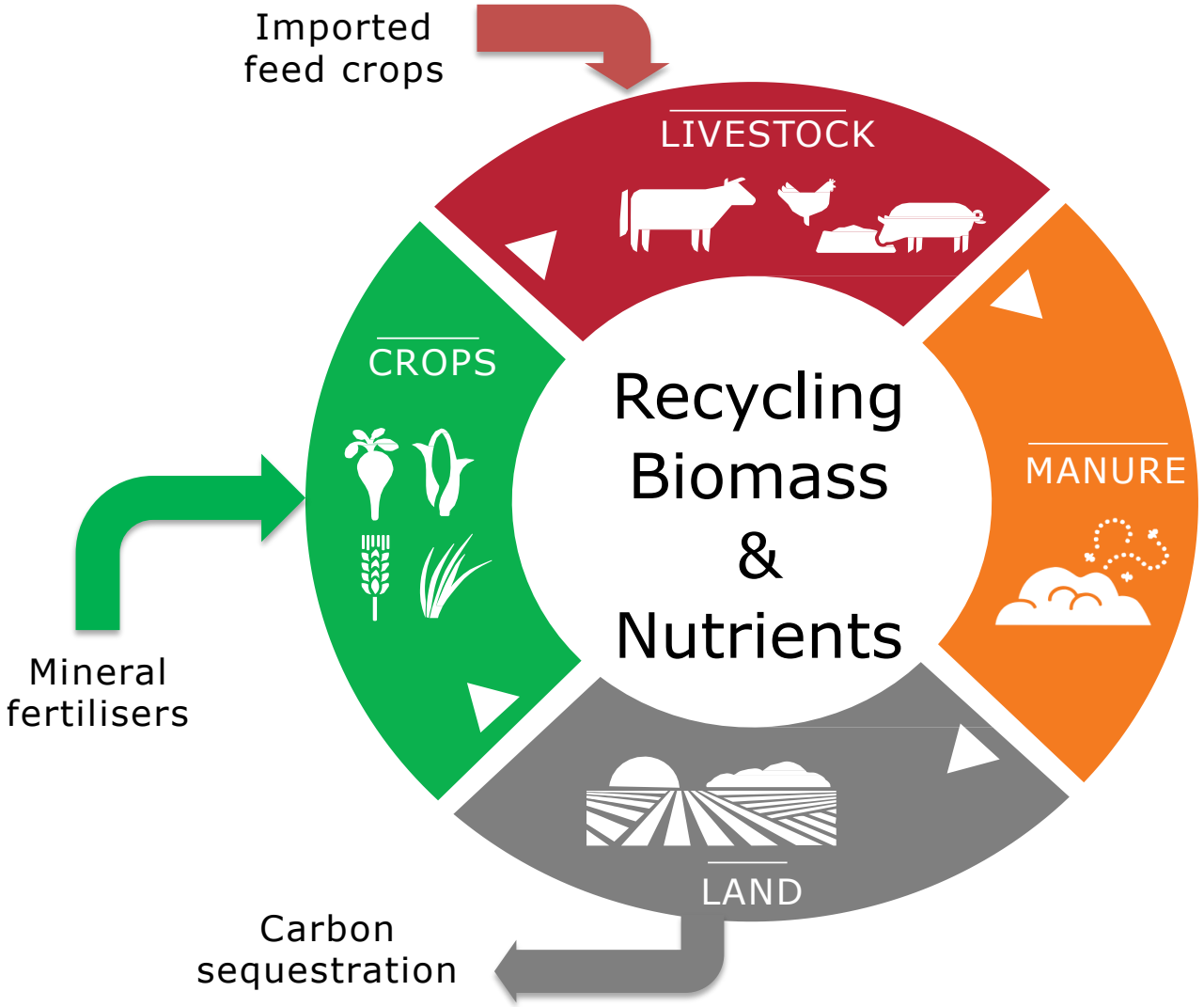
Circular Biobased-Economy : Agro-Ecology



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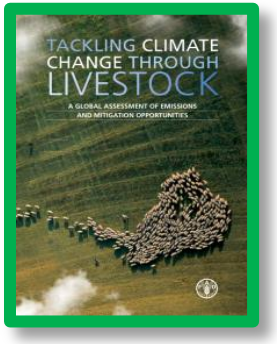
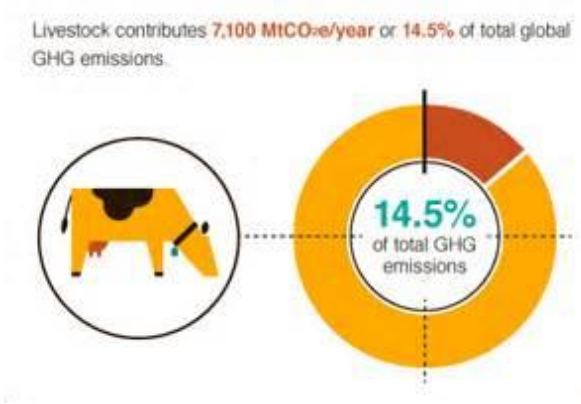
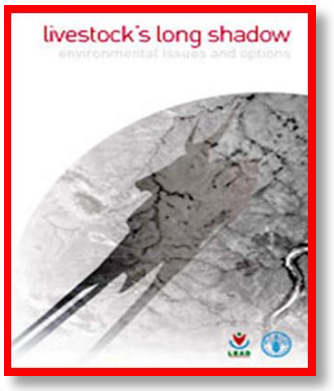
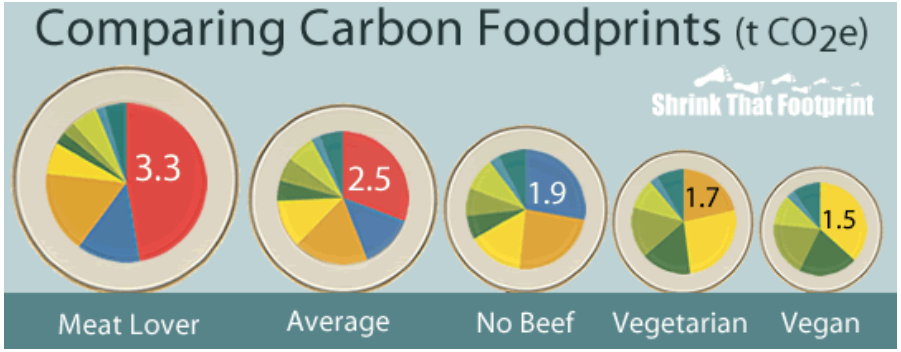
Two sides of the coin







- Covert Biomass into nutritious and appreciated food
- Contribute to optimal use of produced biomass
- Serve the (Agro)Ecosystem functions
- Adaptive to diversity



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Soil C sequestration

Decreased CH_4 emissions per animal

Better fertility

PLF

Reduce no. of animals required per kg of product

Better health

Better nutrition

Better genetics

Manure management

Increased CO_2 emissions per kg feed

Adapted from Gill et al. (2009) Animal . 4:323-333

Soil C sequestration

Decreased CH_4 emissions per animal

Better fertility

PLF

Reduced no. of animals required per kg of product

Better health

Better nutrition

>40% GHG mitigation possible

Better genetics

Manure management

Increased CO_2 emissions per kg feed

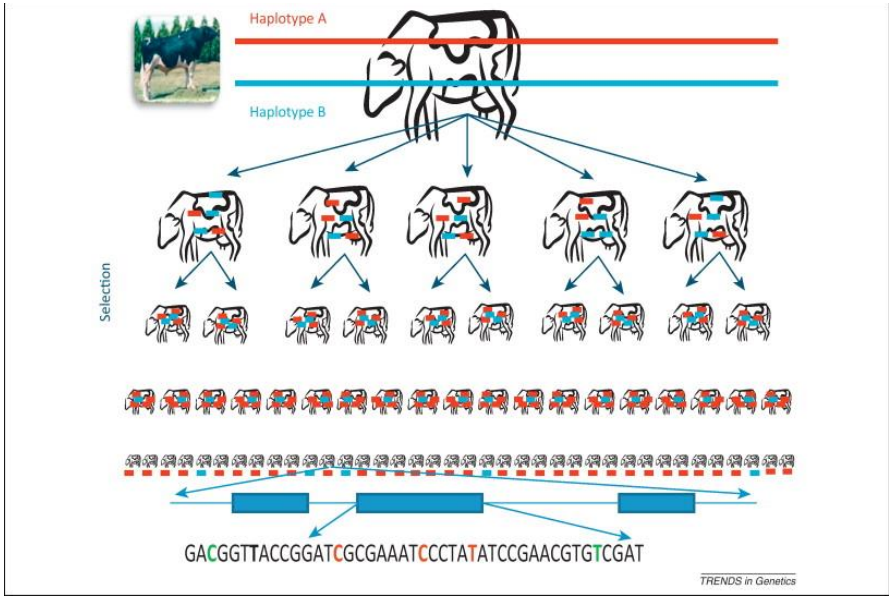
Adapted from Gill et al. (2009) Animal . 4:323-333

Genetics

- More efficient animals
  - Greater yield
  - better product quality
  - Reduced inputs
- Better fertility/fecundity
- Reduced methane production

The future of livestock breeding: genomic selection for efficiency, reduced emissions intensity, and adaptation

Ben J. Hayes[1,2,3], Harris A. Lewin[4], and Michael E. Goddard[1,2,5]



Fertility in dairy cows

Good fertility

↓

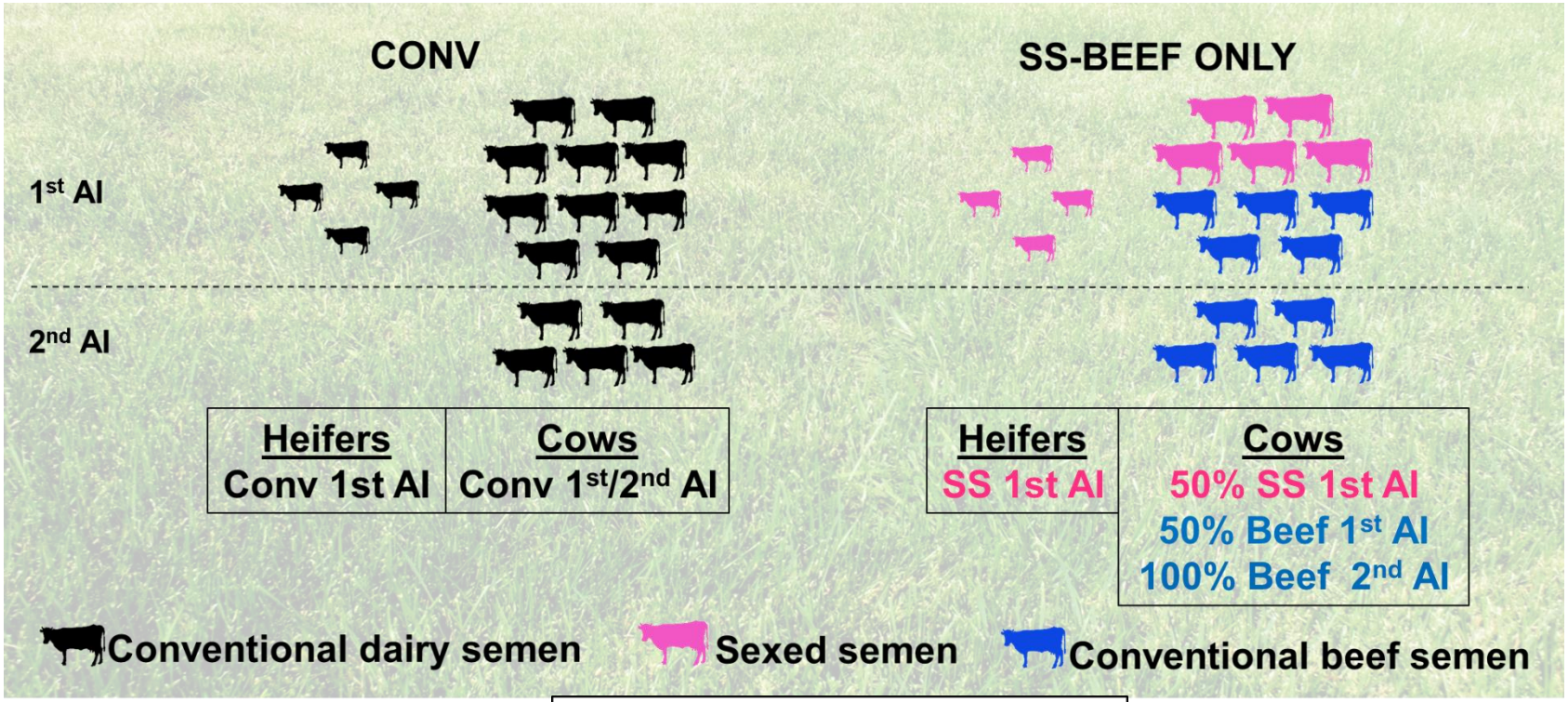
Reduced requirement for replacements

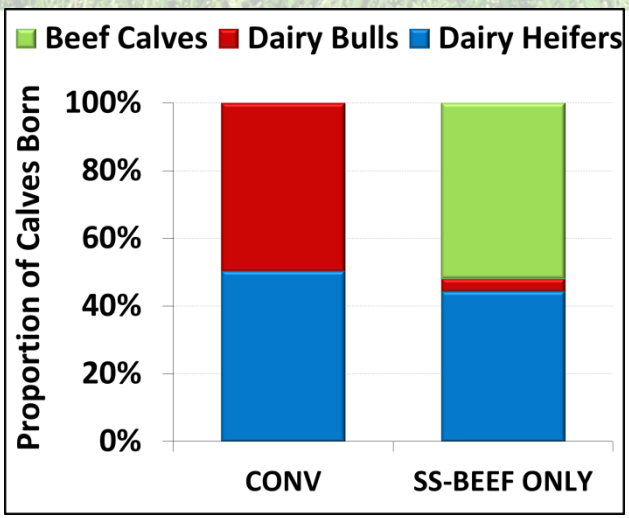
↓

Longer productive life

↓

Reduced herd GHG


CONV
SS-BEEF ONLY
1st AI
2nd AI
Heifers
Conv 1st AI
Cows
Conv 1st/2nd AI
Heifers
SS 1st AI
Cows
50% SS 1st AI
50% Beef 1st AI
100% Beef 2nd AI
Conventional dairy semen
Sexed semen
Conventional beef semen

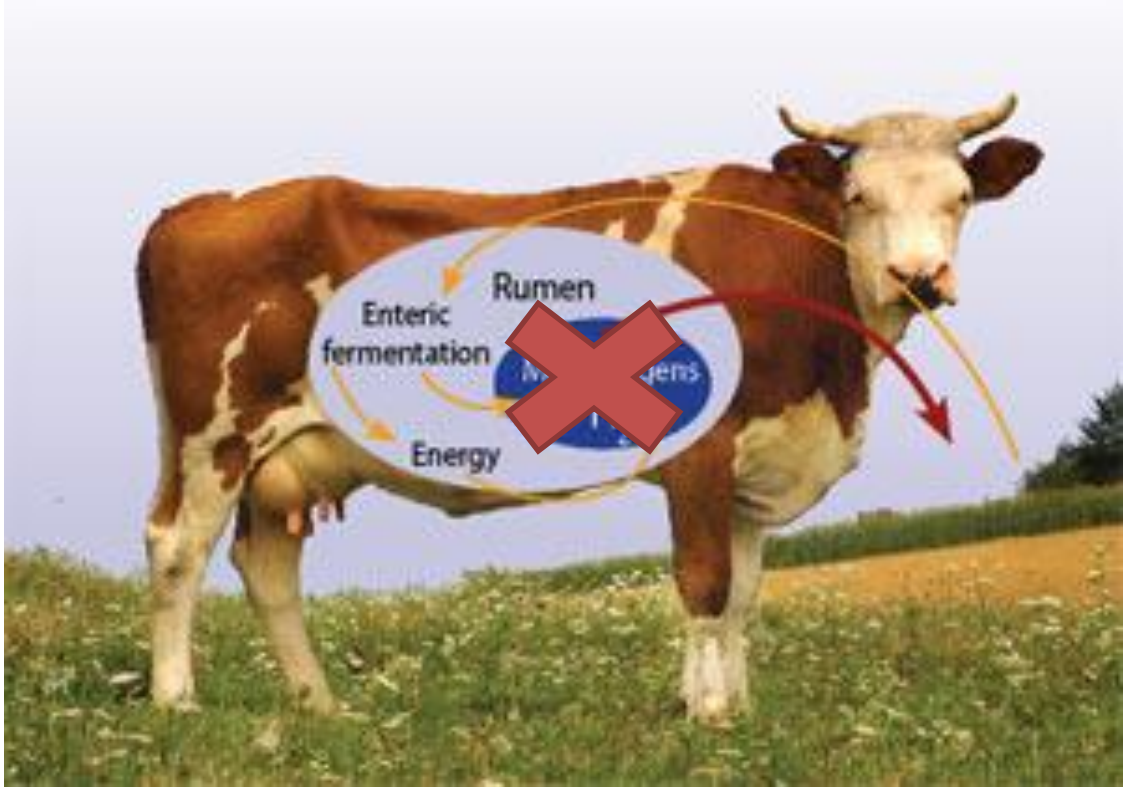

Beef Calves
Dairy Bulls
Dairy Heifers
Proportion of Calves Born
100%
80%
60%
40%
20%
0%
CONV
SS-BEEF ONLY

Health

- Improve overall animal health
- Reduced incidence of disease
  - Reduced mortality
  - Reduced morbidity

Nutrition

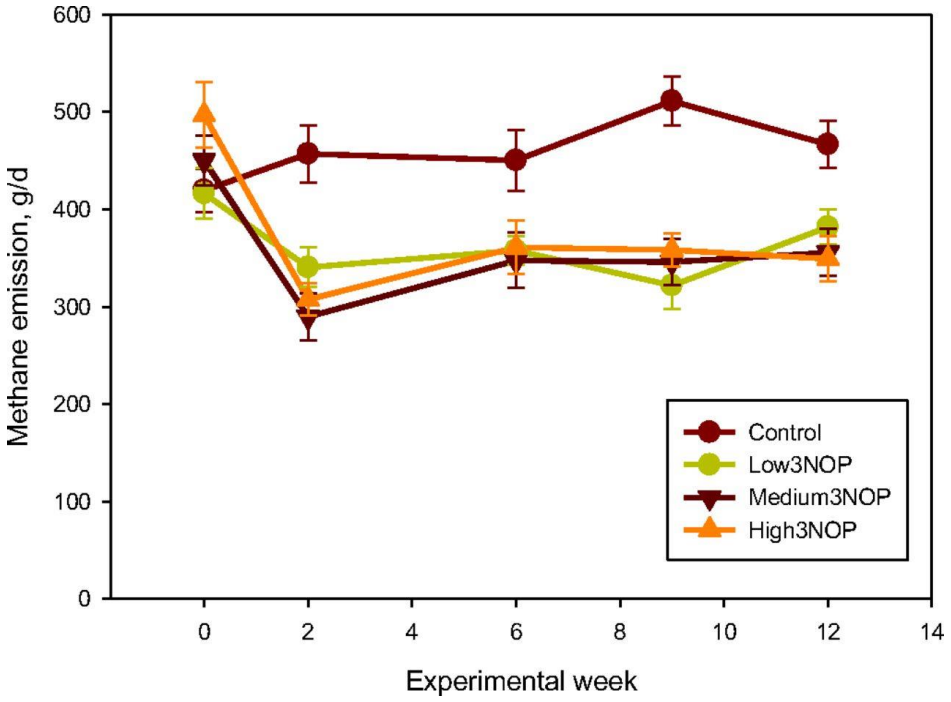
- Improving feed quality and digestibility
- Reduce methane output



3-Nitrooxypropanol

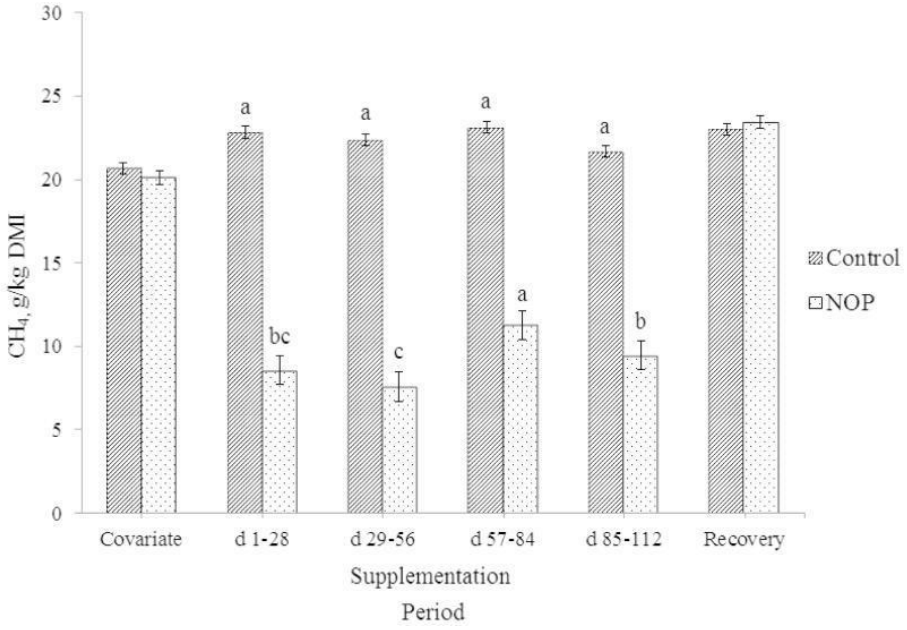
Methane emission reduced with 3-nitrooxypropanol (3NOP)

Dairy



Hristov et al. PNAS 2015;112:10663-10668

Beef



Romero-Perez et al (2015) Journal of Animal Science

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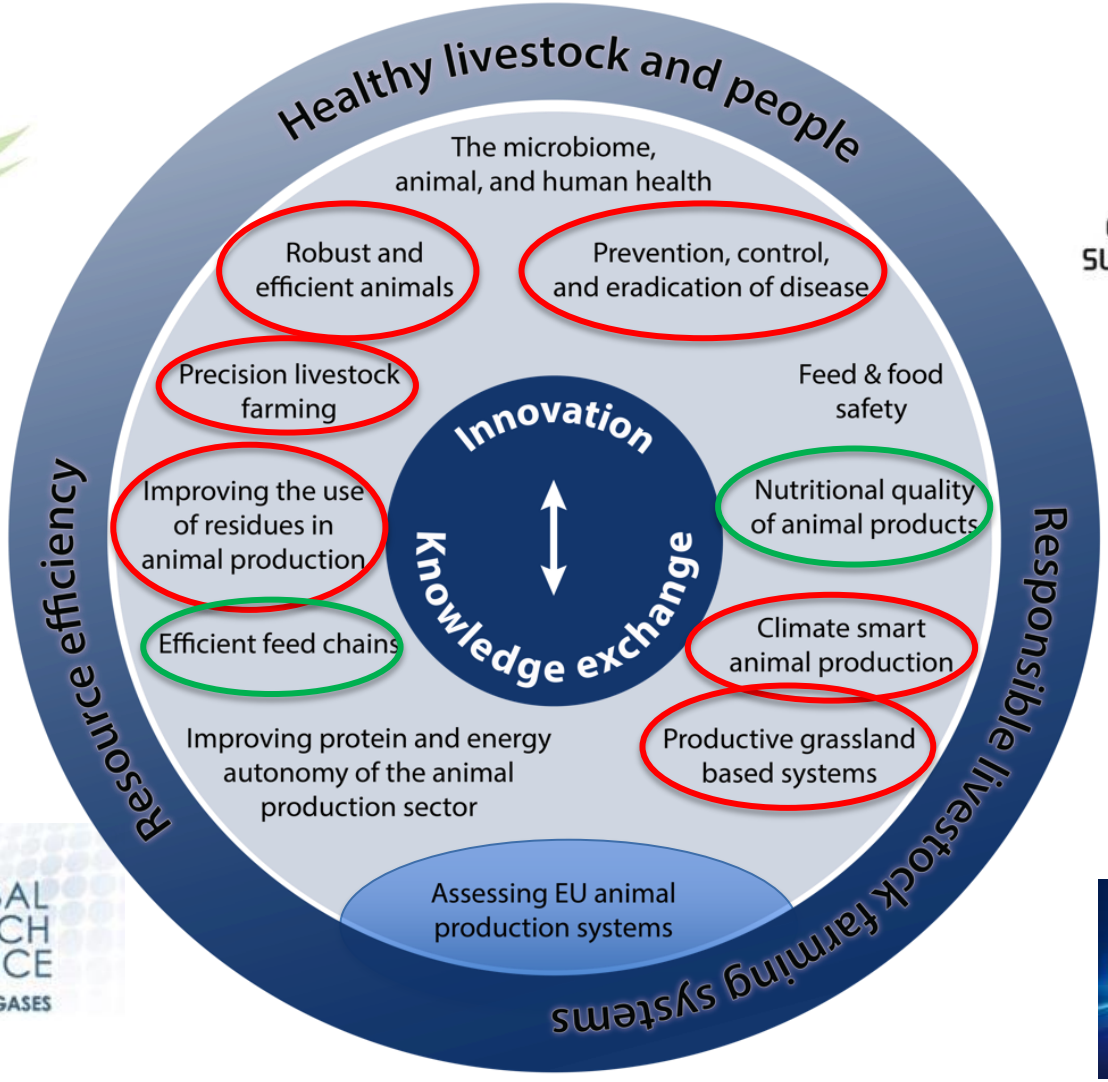
Towards Sustainable Livestock Production



SCAR Standing Committee on Agricultural Research

GLOBAL AGENDA FOR SUSTAINABLE LIVESTOCK

leap LIVESTOCK ENVIRONMENTAL ASSESSMENT AND PERFORMANCE PARTNERSHIP

FACCEJPI

European Aquaculture Technology and Innovation Platform

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION HORIZON 2020

Concluding Remarks

- The World needs more Livestock
  - *"Short Shadow"*
  - Convert feed into food
  - Circular biomass-based economy
  - Adapted to the Societal Challenges
- Broad and Global Perspective
  - Innovations, with Care
  - Fostered by Knowledge, Enabled by Technologies