

Which breeds and breeding goals for (bio)diverse future livestock systems ?

1 December 2020

Sipke Joost Hiemstra - Centre for Genetic Resources, the Netherlands (CGN)



Biodiversity under threat – wild and domesticated



BIODIVERSITY CONVENTION

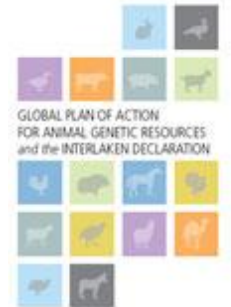
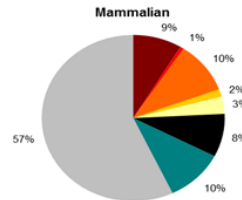
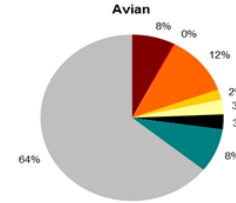
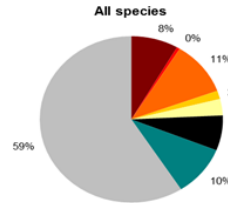


Preparations for the Post-2020 Biodiversity Framework



Farm animal genetic diversity

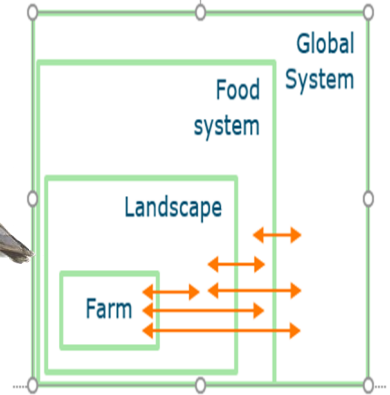
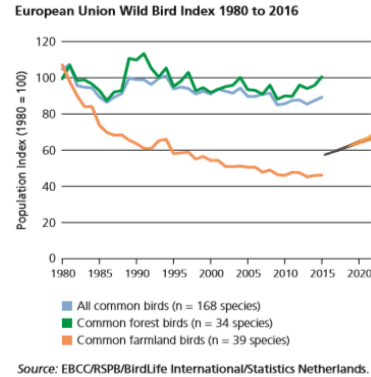
- Diversity of breeds
- Genetic diversity within breeds
- Need to conserve and to promote sustainable use



Transition needed in agriculture/livestock sector

Negative side effects of dominant (specialized/intensive) livestock systems

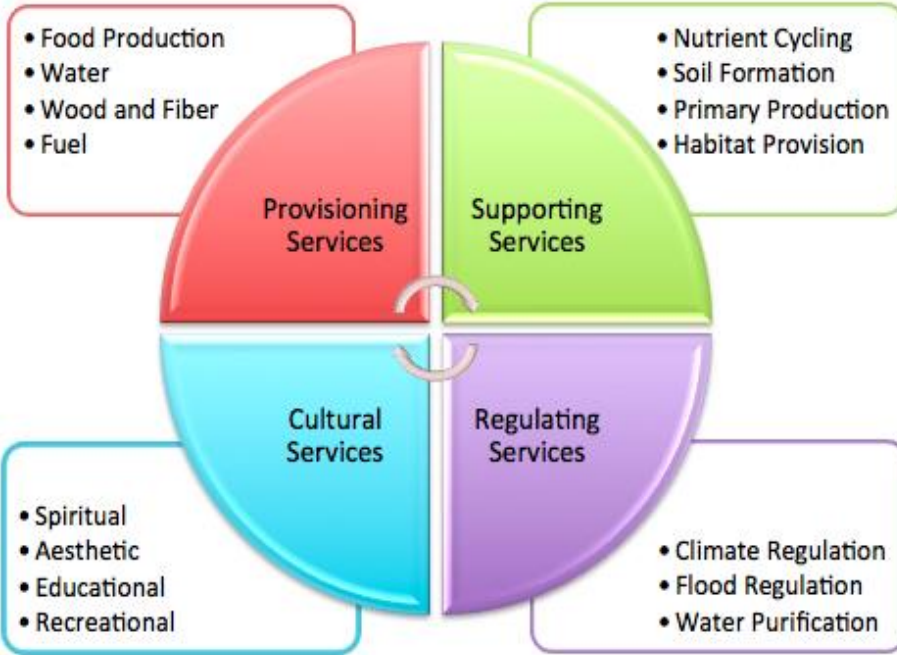
- **Loss of biodiversity**
- GHG emissions
- Animal welfare and ethical issues
- Antimicrobial resistance
- Zoonoses



- ➔ Future livestock systems should follow **agro-ecology** & **circularity** principles
- ➔ Diversification of livestock systems!
- ➔ Context specific optimization



Livestock systems and Ecosystem services



Source: Millenium Ecosystem Assessment, 2005.

Animal Genetic Resources & Ecosystem services

Reported positive impacts of livestock grazing:

- Cultural, historic and natural heritage (84%)
- Knowledge systems/educational values (77%)
- Landscape values (74%)
- Habitat provision (66%)
- Nutrient cycling (65%)
- Bush encroachment/fire control (66%)

Relevant breed characteristics (FAO, 2015)

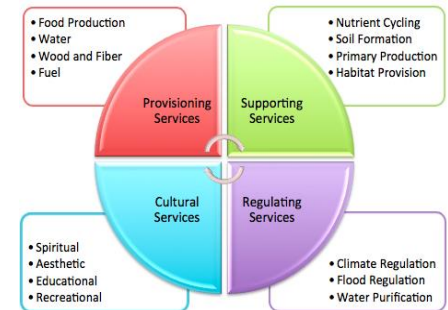
- Adapted to mountain areas, marginal and harsh production environments, and fragile soils
- Grazing and browsing habits, incl. effectiveness in removing specific weeds or invasive plants

Animal, page 1 of 12 © Food and Agriculture Organization of the United Nations 2018.
doi:10.1017/S1751751731118001027



Perception of livestock ecosystem services in grazing areas

G. Leroy^{1†}, I. Hoffmann¹, T. From¹, S. J. Hiemstra² and G. Gandini³



Source: Millennium Ecosystem Assessment, 2005.

Which breeds and breeding goals for future livestock systems ?

- Choice of species, breeds and breeding goal should follow livestock system characteristics

2 different (extreme) Scenario Examples – Dairy production systems:

A. Further intensification and specialization

- “Sparing”
- Production efficiency per kg product
- High input and output per hectare
- Diet and feed efficiency optimized
- Limited grazing
- Limited added value per kg product

B. Nature-inclusive and biodiversity friendly

- “Sharing”
- High Nature Value farmland
- Low input and output per hectare
- Available resource use efficiency
- 100% grazing
- Higher added value per kg product & payments for ecosystem services and biodiversity

Breeding goal for “nature inclusive” systems?

- Resource use efficiency
 - Make optimal use of available feed resources
 - Feed of varying quality and nutritional value
 - Cope with periods of feed scarcity and extreme temperatures
- Resilience/robustness together with Productivity
 - Passive robustness (resistance)
 - Active robustness (flexibility)
- Animal behaviour
 - Adaptation to predators
 - Interaction with humans



A conceptual approach to design livestock production systems for robustness to enhance sustainability^{1,2}

J. ten Napel^{1,3,*}, A.A. van der Veen^{1,3}, S.J. Oosting⁴, P.W.G. Groot Koerkamp^{1,3,c}

¹ Wageningen University, Farm Technology Group, P.O. Box 338, 6700 AH Wageningen, The Netherlands

² Wageningen UR Livestock Research, P.O. Box 65, 8200 AB Lelystad, The Netherlands

³ Wageningen University, Animal Production Systems Group, P.O. Box 338, 6700 AH Wageningen, The Netherlands



Breeding goal: dual-purpose or further specialization ?

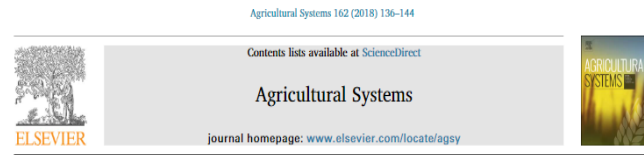
- Dairy and/or Beef
- In one dual-purpose system, or in two separated specialized systems



OR



Revival of dual purpose dairy cattle breeds?
“Increasing the beef output from dairy systems may contribute to lower emissions of milk and beef production. Dual purpose breeds have shown potential for an integral reduction of environmental impacts of milk and beef” (Vellinga, 2018)



Effectiveness of climate change mitigation options considering the amount of meat produced in dairy systems



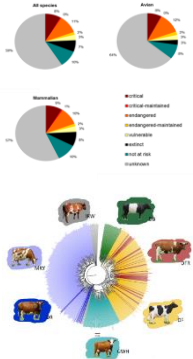
T.V. Vellinga*, M. de Vries

Wageningen Livestock Research, Wageningen, the Netherlands



In summary: Maintaining a broad genetic base for future, diverse livestock systems? How?

- Opportunities for breeds-at-risk in (bio)diverse livestock systems
- Make best use of genetic diversity within and across breeds. “One size does not fit all livestock systems”
- Valorization of breed specific products and (public) payments for Ecosystem Services
- Breeding programs: Maintaining genetic diversity & Genetic improvement
- Gene banks as a complementary strategy
- ERFP - European coordination



Thank you for your attention

