WAGENINGEN
UNIVERSITY & RESEARCH

Biodiversity and Food Systems

The need to enhance crop, livestock and aquatic genetic diversity in food systems

KB-35-007-001

2021-2022

March 2022

Malou van der Sluis (WLR), Niels Anten (PSG), Esther van Asselt (WFSR), Gerbrich Bonekamp (WLR), Theo van Hintum (WPR), Rolf Michels (WEcR), Marjon Navarro (WFBR), Jeanne Nell (WEnR), Nico Polman (WEcR), Sipke Joost Hiemstra (WLR)

Objectives and methods

Biodiversity loss is a global threat and biodiversity for food and agriculture is particularly relevant in the context of our food systems. We investigated the current status and trends of crop, livestock and aquatic genetic diversity (**CLAGD**). Moreover, we investigated the observed and perceived impacts of lower or higher levels of CLAGD, as well as opportunities for increasing CLAGD, in relation to four food system dimensions (**Figure 1**). These dimensions are: 1) safe and healthy diets, 2) food security, 3) inclusiveness and equal benefits, and 4) sustainability and resilience (Van Berkum et al., 2018).

This was studied through a literature review, as well as expert and stakeholder interviews. A framework was subsequently developed to visualise the relationship between different measures for enhancing CLAGD and the food system dimensions (**Figure 2**).

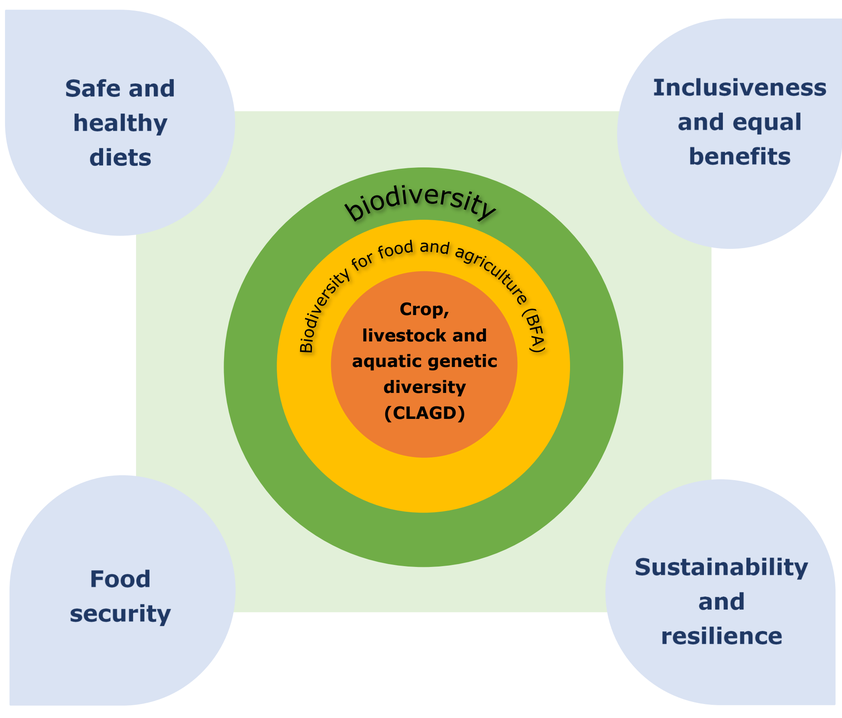

Figure 1: Schematic overview of CLAGD in relation to the four food system dimensions.

Interview results (n = 10)

- Main conclusions:
  - Stakeholders respond to consumer or societal demands, but large incentives for increasing CLAGD are lacking from consumers
  - Changes often aimed at increasing sustainability in broad sense – limited attention for increased genetic diversity as a goal in itself
  - Multiple (policy) measures and (economic) incentives needed to initiate change

What's next?

- Completing a report and policy brief based on the results
- Further research into the relations in the CLAGD assessment framework, including refinement of indicators and measures (**Figure 2**)
- Examining knowledge gaps in the draft CLAGD assessment framework through case studies
- Continuation of selected research case studies in 2023-2024 (KB)

Results and contribution to food system transition

State of conservation and use of CLAGD
- CLAGD shows a declining trend, potentially resulting in e.g., insufficient diversity for breeding for new systems or circumstances
- Clear consensus on how to measure and monitor CLAGD is lacking
- Major conservation gaps remain, despite increasing efforts

Safe and healthy diets
- More biodiverse diets can have positive effects on human health
- Increased biodiversity can have positive and adverse effects on diet safety

Food security
- Increased genetic diversity can contribute to the prevention of disasters and to access to food

Inclusiveness and equal benefits
- Increased CLAGD can potentially contribute to improved inclusiveness and equal benefits, and can potentially aid in conservation of on-farm CLAGD

Sustainability and resilience
- Positive effects of crop diversification or multispecies systems (crop, livestock, aquatic) on ecosystem services and production levels, as well as a potential reduction in required external inputs

We devised a conceptual assessment framework, to make explicit the trade-offs and synergies of different potential interventions, to increase the use of CLAGD and their effects on different indicators for the four food system dimensions (**Figure 2**). The scores and trade-offs in this framework are dependent on scale and context. Local-level trade-offs cannot always be generalised to the regional or global level.

Example implementation of framework

Figure 2 shows an example of implementation of the framework for the goal of ***limiting pesticide use*** through CLAGD-related measures.

Measures associated with limiting pesticide use	Safe and healthy diets	Food security	Inclusiveness and equal benefits	Sustainability and resilience
More crop diversity	++	±	+	+
Breeding for resistance	+	+		++

Figure 2: Example of the framework for visualizing the (expected) effects of different CLAGD-related measures for limiting pesticide use on the four food system dimensions.

Questions for audience

- Do you see links with your work, also for follow-up case studies?
- How can we collaborate to make progress?

Wageningen University & Research
P.O. Box 338, 6700 AH Wageningen
Contact: sipkejoost.hiemstra@wur.nl
T + 31 (0)317 480506
https://www.wur.nl/nl/Onderzoek-Resultaten/Themas/Biodiversiteit/Biodiversiteit-in-voedselsystemen.htm