ReLive Project 1st Workshop Report 2022

The 1st workshop on "**Adaptability and Resiliency of Global Agricultural Systems to Climate Change"** of the ReLive Project, entitled "**Back to the Future: Reintegrating Land and Livestock for Greenhouse Gas Mitigation and Circularity**" funded through the partners of the Joint Call of the Co-fund ERA-Nets SusCrop (Grant N° 771134), FACCE ERA-GAS (Grant N° 696356), ICT-AGRI-FOOD (Grant N° 862665) and SusAn (Grant N° 696231), and the respective national funding agencies including the GRA (Global Research Alliance of Agricultural Greenhouse Gases).


Images: ReLive project funding sources

The workshop was held on 31 August 2022 as part of the ISCRAES 2022 (www.iscraes.org), and sponsored by the ReLive project. The coordinator Prof. Bruce Osborne introduced the overall activities of the project, and the significance of the workshop themes. Three groups composed of ISCRAES 2022 participants, and the project partners were formed, with each group led by one of the ReLIVE collaborators, Dr. Bart Kruijt (Netherlands), Dr. Katja Klumpp (France) and Prof. Jorge Perez-Quezada (Chile). Each group also had a project partner as a facilitator: Dr. Pia Gottschalk (Germany), Prof. Gerado Moreno (Spain), Prof. Lea Hallik (Estonia), Dr. Anna Walkiewicz (Poland), Dr. Jonathan Herron (Ireland), Mr. Saku Juvonen (Finland) and Dr. Ibrahim Khalil (Ireland), who compiled and finalised the outcomes of the discussions from the different groups.

Each of the groups were asked to discuss and respond to six common questions. A summary of the group responses to each of the questions is documented below:

1. **Would the reintegration of livestock increase or reduce the adaptability and resilience of farming systems to climate change?**

Positive as well as negative aspects of reintegration of livestock increase or reduce the adaptability and resilience of farming systems to climate change were discussed. On one hand, a more diverse farm could be more resilient against all kinds of external threats including climate change. However, in a closed circular farm, the whole chain depends on each contributory part so it could also be more vulnerable. Scale is an important issue and in the modern world, one single farm can hardly be circular as each component would be too small for the market. Labour and expertise would also have to be much more diverse. Therefore, collaboration between neighbouring farmers is necessary, through the formation of cooperatives or other arrangements, which is in itself also a risk. Modern farmers are not that keen on collaboration, and prefer to source often cheaper fodder, and materials, for example, from the market than from their neighbours.

Reintegration of livestock could reduce adaptability and resilience because livestock increases GHG emissions. However, its optimal implementation could make the approach positive with the assumption that the total amount of livestock in the region is not increased. A combination of crops and forest could increase the total productivity, but this will depend on the site-specific land and land use systems. For intensive milk production, incorporation of crops will be beneficial while enhancing circularity. On the other hand, the adaptability and resilience of farming systems to climate change

may be reduced with widely separated production systems and be site-specific. It may face an allocation problem and requires a more adapted feed vs. cropping systems, which implies requires optimization of the share of grass vs. crop land, and consideration of crop rotation, fertilisation and grazing practices.

The benefits could depend on location and the difference between (over) developed and developing countries. In developing counties, Integrated Livestock Systems (ILS) have already been adopted under several situations. The approach would provide new options to provide new products, diets and markets in the (over) developed countries. This might lead to improve autonomies/self-sufficiency, and independence from markets in EU countries, which may be reduced in the future. The approach would be more resilient through the diversification and provision of a wider range of possibilities/options including the introduction of the circular economy and reducing the reliance on specialised production systems.



Images: ReLive project workshop participants within ISCRAES 2022

2. What management interventions could be used to increase resilience?

In addition to the above recommendations, there are of course numerous management options that could be implemented for the more appropriate management of soils/lands and water that make the systems more resilient. In a circular system, it is easier to employ 'monogastric' animals (e.g. pigs and chicken) than ruminants as the former can eat more diverse sources of food and waste materials. Farmers should consider appropriate management interventions to increase resilience in their farming for example:

- Grazing management should consider practices that are based on weather data, store fodder to avoid potential limitations to cold and drought and reduce environmental contamination by using buffer zones.
- Appropriate water management in semi-arid lands should be used to reduce infiltration particularly during periods of rainwater harvest.
- Increase diversity (complexity) in the system at the species, community, ecosystem and landscape (catchment; movement of animals) levels could be beneficial.
- Change animal breeds to those that are more resilient and cultivate tolerant crops and grasses, as well as the application of biochar as a soil management approach to increase water retention.

To achevé increased resiliency, management practices including diversification could be beneficial particularly a move from monocultures to mixed multi-species, the use of hedges, cover crop mixes for feed and avoidance of drought impacts, together with the introduction of catch/cover crops. Irrigation might be a good solution in some places and might still contribute to sustainable productivity, but this needs to be combined with genetic improvements to minimise the use of this and other natural resources. On the other hand, resilience could decline if a variety of species is not present in the hedgerows. Several management options (coppicing, laying, etc) with an annually trimmed hedgerows could be beneficial particularly for carbon sequestration. Manure separation techniques can be integrated into agricultural manure and digestate management systems, linking to minimisation of transport associated costs, as a valid approach under some circumstances but with a due concern on how to reduce excessive phosphorus loss and improve water quality.

3. To what extent would livestock dietary changes that reduce methane emissions be acceptable?

Discussion on this question was mainly focused on the acceptability of additives such as garlic or more artificial ones. Apart from animal welfare issues, it was mentioned that the (European) consumer may not accept their meat or dairy if fodder were it too 'artificial' or if cattle were to stay inside to reduce methane emissions. The benefits of multi-species swards, etc. is not certain.

However, as long as it costs less, farmers could accept the change, but there is a restriction. Because they may own the grasslands as well as the animals, there could be an issue relating to animal welfare. Increasing production or growth efficiency i.e. animals ready to sell in less days by increasing the diversity of pasture could be effective in releasing less methane. This could, however, create a problem because it adds complexity to the system management and farmers may be unable to accommodate this within their normal farming schedule.

The implementation of any dietary change would also be cost depended, and if cheaper compared might work. Improvements in diet quality could make this more acceptable through the introduction of species mixtures and diet shares from crop/grass including species with methane reduction compounds e.g. plantain, tannins, as well as the use of complementary food sources, such as seaweeds. Ethically, additives and genetical approaches if they are economically viable may be acceptable.

4. Would farmers prefer direct quantification of emissions/C sequestration, or would they accept model (average) results?

Direct quantification of emissions/C sequestration as well as acceptance of model results by farmers will depend on their neighbours/fellow farmers i.e. if farmers don't trust their neighbouring farmers, then direct evidence-based measured outputs may be needed as proof. In the group, there was as much scepticism on the value of both measurements (not general enough, not feasible) as there was on models (too general, too complex, too many assumptions). Validation of methods/models should be simple, feasible and fair. It is important to engage the farmers, whatever the approaches used.

Farmers want to know what is happening in their fields. They need some way to verify how they are doing (indicators easy to apply). This will vary and depends on the farmers, the time it will take to gather the information, and how much they trust the person/organisation in doing the verification/modelling. A low-cost (easy) method of verification is required.

Quantification emissions/C sequestration will depend on what we monitor and which methodology we are using and whether it would lead to certification. The questions are how to deal with negative evidence, whether this should lead to sanctions (e.g. N directives) and if so, this might lead to major legal and fiscal complications.

For C credits, model (average) results might be a preference as this shows the endpoint and what can be achieved. Models could provide contributory evidence and identify hotspots for improved verification procedures. This will help in decision making, land use planning and C accounting to encourage/provide incentives to farmers.

5. Is true circularity feasible? What would we need to do to achieve this?

It is important to define "What is 'TRUE' here, whether complete or not, and on what scale should the circle be closed?" As farmers are dependent on economically viable outputs, full closure is not possible at the farm scale. Currently, the focus is on the recirculation of (human/food) waste. Nowadays, there are many regulations (health, etc.) that prevent the use of these by-products. Employing insects as an intermediary is an option but still bound by many rules. There are several 'red herrings as far as alternative food sources are concerned, ' but not all these solutions are realistic.

It may be less risky for a farm with crops to integrate animals than the other way around. Specialization by farmers is a barrier to the reintroduction of animals on individual farms. Integration can, however, occur at the landscape level (between farms), instead of at the farm level. These are policy and regionally context (availability of different resources) dependent, and an increased circularity at the regional level may be a more realistic objective rather than accounting for wastes or by-products at each farm level.

Circularity is feasible at a regional scale by developing the appropriate infrastructures and if system borders can be overcome. It is important to report management practices at farm level to better visualise N use to identify where N mineral goes on a national basis. Demonstration farms would help improve awareness and the practicality of implementing the appropriate management practices. However, circularity may be implementable at the farm scale, but need to be associated with risk analyses.

6. What incentives could farmers get to reduce GHG emissions (or increase biodiversity /sustainability)?

In general, incentives in terms of monetary benefits to farmers for reducing GHGs, maintenance of biodiversity and attainment of sustainability is exemplified by the need of both the stick and the carrot approach. There needs to be clear material and financial advantages associated with any drive towards sustainability with both practice-based and results-based benefits for payments. For practice-based payments, a correction mechanism is required at a later period to verify whether the measures had the desired effect. Thus, base-line benchmarks are important otherwise it may not work. It is important that farmers take ownership of the measures and are convinced of its usefulness to make them work. It may also make a difference whether a farmer works on his own land or on rented land.

Finally, flexibility is important for farmers to be able to come forward with their own ideas for mitigation and credits should be given where there are clear verifiable benefits. Direct payments, based on measurable indicators, might also have some implementation cost for farmers. However, increase in social recognition and the provision of risk analyses are important and farmers need clear information of the benefits of any changes.

Subsidies should be in place to encourage farmers to adopt eco schemes and good practices and their sustainable maintenance. However, sanctions will also be required. For marketing their products, the provision of certificates and product labels will be advantageous. Public awareness policy should also be formulated and implemented to make any actions work.