EIP-AGRI Focus Group

Sustainable beef production systems

FINAL REPORT

March 2021

funded by European Commission

Table of Contents

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1. Executive summary

Innovative grass-based* beef[1] production systems can help address the challenges faced by the European beef sector as well as citizens' concerns about the sustainability of the current beef production and consumption levels. When managed correctly, grass-based* beef production systems contribute to improving biodiversity, capturing carbon, sustaining the soil microbiome, structuring the landscape, preventing erosion and forest fires. This is in addition to their primary role in transforming non-edible resources into human food with a high nutritional value, and to their economic contribution in maintaining vital rural areas. Innovative approaches, arising from cooperation between farmers, other actors in the value chain, including researchers and advisers and with citizens, can support the grass-based beef sector to become more economically, environmentally and socially sustainable.

This report presents the findings and conclusions of the EIP-AGRI Focus Group (FG) Sustainable beef production. The FG consisted of a temporary group of 20 experts (see **Annex 2**) with complementary types of knowledge, from 15 European countries. The main question which guided the FG discussions and activities was "**How can grass-based* beef production systems, based on agroecology principles, remain sustainable?**". When addressing this question, the experts of this FG defined "sustainable grass-based* beef production" as *a type of production which is based on the agroecological principles[2] of environmental, economic and social sustainability and for cattle which is predominantly grass-fed and grazed on pastures where possible given the soil and climate conditions*.

The experts selected 5 main topics to focus on. They elaborated mini papers for four of these topics. Figure 1 summarises the key issues per main topic, including ideas for Operational Groups and other innovative projects, and research needs.

[1] "Grass-based* beef" is defined as a type of beef production which is based on the agroecological principles of environmental, economic and social sustainability and for cattle which is predominantly grass-fed and grazed on pastures where possible given the soil and climate conditions for the purpose of this report.

[2] More about agroecological principles http://www.fao.org/3/I9037EN/i9037en.pdf and https://www.reseaurural.fr/sites/default/files/documents/fichiers/2020-03/2020_pei_rapport_final_enrd_web_anglais.pdf - see in particular page 18 to 23.

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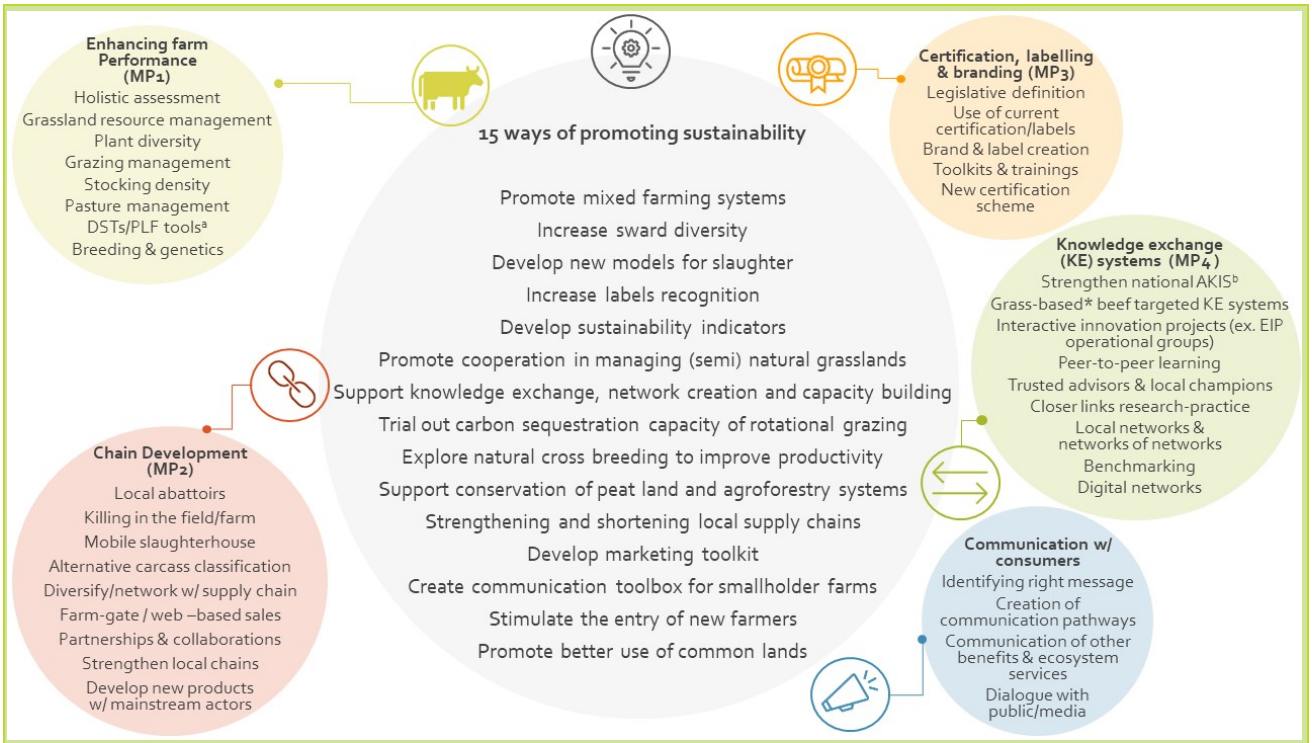

Figure 1 Identified key issues and Operational Group ideas

a. DSS/PLF: Decision Support Systems/Precision Livestock Farming
b. b AKIS: Agricultural Knowledge and Innovation Systems

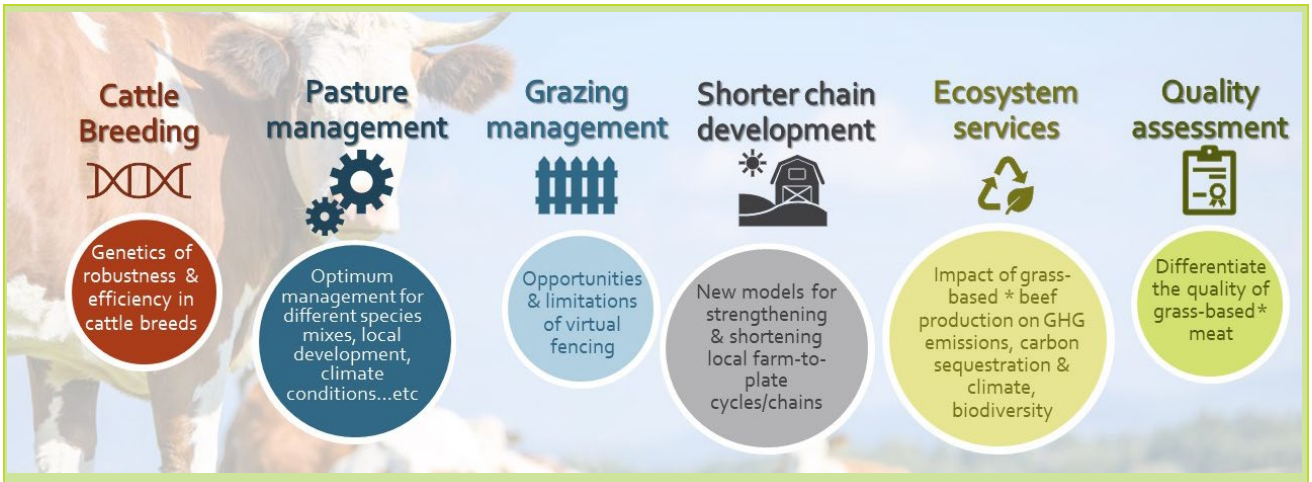

Figure 2 Identified key issues and Operational Group ideas

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2. Introduction

The Focus Group (FG) on sustainable beef production was launched in 2020 as part of the activities carried out under the European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI). The main question for this Focus Group was "**How can grass-based* beef production systems, based on agroecology principles, remain sustainable?**".

Beef production has been subject to criticism at global level mainly due to its climate and environmental footprint as well as concerns about the impact of beef consumption on health. The European beef sector also faces challenges regarding the social and economic aspects of sustainability, such as the dependence on subsidies, income differences among different regions and difficult working and living conditions for famers and their families. All these negative perceptions and challenges within the sector have led to a search for more environmentally and animal friendly production methods while at the same time improving the economic and social aspects of beef production.

Innovative approaches can help the grass-based* beef sector (see definition below) to address the current challenges and become more economically, environmentally and socially sustainable. When managed correctly following sustainable strategies, grass-based* beef production systems offer many benefits to society, addressing citizens' concerns by providing many ecosystem services and public goods, partially compensating the greenhouse gas emissions of beef production. They contribute to improving biodiversity, capturing carbon, sustaining the soil microbiome, structuring the landscape, preventing erosion and forest fires. In addition, they transform resources which are non-edible to humans into human food with a high nutritional value and play a role in maintaining vital rural areas.

The work carried out by the FG comprised the following specific tasks:

- Identify *practices and strategies to increase environmental, social and economic sustainability* of grass-based* beef production systems in Europe (including agroforestry) and collect inspiring examples and good practices.
- Discuss how traditional business models can evolve to *better valorise the ecosystem services and public goods* provided by grass-based* beef production systems.
- Collect good examples of *communication strategies and tools* which deliver objective and evidence-based information to consumers and citizens.
- Propose *potential innovative actions and ideas* for Operational Groups.
- Identify *needs from practice and possible gaps in knowledge* related to the sustainability of beef production systems which could be solved by further research.

The discussions within the FG acknowledged that grass-based* beef systems could cover a number of different production methods and feeding regimes such as beef produced from dairy, beef or dual purpose cattle, of mixed breeds or pure-breeds of cosmopolitan or local breeds; suckler, fattening and finishing systems with different grazing durations depending on farm environment and climatic conditions, use of different grass based feed sources, etc..

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The FG experts note that the term "grass-based beef system" is sometimes used for systems where cattle do not graze on pastures at all and grass may be only a minor part of feed. The use of the term in this way could be seen as an attempt to influence consumer preferences - so-called "grass-washing". The FG experts expressed doubts about the sustainability of such systems and agreed that the work of this FG covers "***beef produced based on the agroecological principles of environmental, economic and social sustainability[3]; and for cattle which is predominantly grass-fed and grazed on pastures where possible given the soil and climate conditions***". Therefore, it should be noted that every time the term "grass-based* beef" is used in this report, it refers to this definition.

[3] More about agroecological principles http://www.fao.org/3/I9037EN/i9037en.pdf and https://www.reseaurural.fr/sites/default/files/documents/fichiers/2020-03/2020_pei_rapport_final_enrd_web_anglais.pdf - see in particular page 18 to 23.

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3. Brief description of the process

The FG is a temporary group of 20 experts (**Annex 2**) with complementary types of knowledge and different professional backgrounds. The group included cattle breeders, farm advisers, researchers and representatives from NGO's from 15 European countries. They were selected considering their practical experience and technical knowledge on the topic.

A starting paper prepared by the FG coordinating expert set the scene for the group work, together with the results of a brief questionnaire sent to the experts before the first meeting, in order to identify the main strengths and weaknesses, opportunities and threats of the grass-based* beef systems, and to make an inventory of good practices. The experts met virtually due to the Covid-19 pandemic during two online meetings in April/May and October 2020. The discussions during the first meeting focussed on innovations and good practices that would increase the valorisation of the ecosystem services and public goods provided by grass-based* beef systems, to bring out new forms of cooperation and networking, and support the transformation of traditional business models. The experts prioritised five key topics which they discussed in depth, and which form the building blocks of this final report. Four of these topics were further elaborated in Minipapers (see **Annex 3: List of Minipapers**), The second meeting focused more on the draft Minipapers, EIP operational group ideas and other innovative projects as well as the needs for further research from practice and academia.

Focus Group Experts

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4. State of play

The FG experts identified five key topics for the economic, social and environmental sustainability of grass-based* beef production in Europe;

i) *Enhancing farm performance (MP1),*
ii) *Chain development (MP2),*
iii) *Certification, labelling and branding (MP3),*
iv) *Knowledge exchange systems (MP4),*
v) *Communication with consumers .*

This section will explore the key issues for each of these topics and will focus on key innovation areas addressing the main weaknesses and challenges to the sustainability of grass-based* beef systems in the coming years.

The potential of grass-based* systems to provide public goods and ecosystem services is very important from many points of view, for the farmer as well as for the rest of the society. Therefore, they are addressed where relevant under each topic.

4.1 Enhancing farm performance

4.1.1 Key issues and good practices

The main weaknesses of the grass-based* beef systems in the EU are mostly associated with low profitability, productivity, and efficiency. These result in a lack of competitiveness compared to more intensive production systems or imported beef products, and a weak position vis a vis other agri-sectors . Nevertheless, grass-based* beef systems have a higher environmental sustainability potential, especially if optimum grazing density, good management practices and holistic sustainability assessment approaches are implemented. Taking into consideration regional differences, farm performance could be significantly improved through exchange of knowledge, good practices and innovative approaches, through the creation of new knowledge exchange networks among farmers and by developing holistic thinking (see Starting Paper section on Regulating and Supporting services).

Key issues and related good practices are summarised below (see 6.1 Mini paper n°1: Enhancing Farm Performance "*Management of grass-based* beef production to achieve long term sustainability*").

- **Novel tools for a** *holistic assessment of sustainability of grass-based* beef systems*
  When developing these tools, the trade-offs between ecosystem services and disservices need to be considered and social, environmental and economic aspects need to be included so as to understand the other values created by the farm apart from the beef production. These tools could also help indicate where there is room for improvement to enhance overall farm performance while adapting stocking rates to local ecosystem productivity. (see Box 1)

BOX 1 - LIFE BEEF CARBON PROJECT

CAP'2ER® is a tool to assess the environmental footprint of a farm and identify areas for improvement. It includes indicators for ecosystem services and disservices as well as on economic and working conditions to evaluate the sustainability. As a result, economic., social and environmental aspects of sustainability are all taken into account. These indicators, which concern the management of the herd, feeding, fertilisation and recovery of excreta, etc., are commonly used as part of the advisory missions provided to breeders. [4]

http://idele.fr/services/outils/cap2er.html

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- *Grassland resource management and plant diversity*

  These are key for grass-based* beef farms. They allow the farm to produce beef with low resource input, while providing high output in terms of ecosystem services and public goods. However, grassland management varies a lot due to diverse conditions and requires skills which are adapted to each soil-climate condition, farm structure and the specific objectives of each farmer. The experts identified the following solutions to improve pasture quality: diverse swards, selection of varieties or species adapted to pedoclimatic conditions, weed management, finding optimum diversity of grassland types in the farmland, improved nutrient management, integration of manure and fertilisers, and performance testing of different grass varieties for different environments. Improved pasture quality will also allow farmers to optimise the stocking rate. (see Box 2)

Box 2 - MultiSward Project

MultiSward investigates animal responses to complex swards to better understand the effects of interactions that can occur between plants on digestion and intake. Experiments were conducted with ruminants fed indoors ad libitum to estimate the voluntary dry matter intake and in grazing situation. In many of the studies, animal intake (in sheep, beef cattle and dairy cows) was positively related to mixture complexity. Supplying a mixture of four forage species to beef cattle and dairy cows raised herbage intake levels significantly compared with monoculture perennial ryegrass. Greater pasture intake on multispecies sown swards was observed in most trials and may be related to the fact that a mixture of several forages could stimulate the motivation to eat and to the higher voluntary intake of legumes.

Increased use of multispecies sown swards based on four different species belonging to four different functional groups (non-N fixing vs. N-fixing and shallow rooting vs. deep rooting) could also lead to substantial economic and environmental savings. Growing these mixtures would allow farmers to use less or no nitrogen fertilisers so all the associated environmental and economic costs would be saved.

https://www.multisward.eu/ - **https://cordis.europa.eu/project/id/244983/reporting**

- *Grazing management and stocking density*

  These are among the most important topics for grass-based* beef systems since the interaction of cattle with the local environment is directly related to the services and disservices they provide. Good grazing management and strategies are essential for maintaining soil carbon content, nutrient cycling and biodiversity. These in turn improve soil health, making the soil more resilient to extreme weather conditions leading to better pasture growth, improving grazing performance. However, there is no one-solution-fits-all as the best practices depend very much on the breed, local pedo-climatic and socio-economic conditions as well as farm structure, farmers' objectives and value chain expectations. The FG experts mostly focused on the potential of planned, rotational (see Box 3), Holistic or Voisin Rational grazing (see Box 4), and the development of tools to indicate the optimal stocking rates taking into consideration the different ecosystems, availability of grasslands and water, and grazing duration. Assessing supply and demand, grass measurement (see Box 5), grazing on common land and developing cooperative grazing initiatives can also enhance farm performance (see Box 6).

- *New decision support tools (DSTs) for precision livestock farming (PLF)*

  The development and use of these tools *are key to* improving herd and grazing management, soil health and feed quality. These tools may help to estimate dry matter production, measure grass, calculate forage, estimate grass growth and fodder quality, adapt fertiliser rates, assess soil quality …etc. Tools such as wireless/virtual fences, fattening score evaluation or adapting fertiliser application rate could allow the farmer to adapt how often the animals access feed according to their needs. However, they may not be affordable for or accessible to small-scale farmers, or farms in remote areas, because of high costs or poor data connections. Although the use of virtual fences could facilitate the management of difficult terrains in remote locations, further investigation is needed as there are concerns about animal welfare, effectiveness and cost. Other tools based on GPS or sensor technologies may help improve the interaction between the actors involved in management of shared territories (i.e. High Nature Value farming). (see Box 7)

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- *Improving genetic make-up of animals*

  These improvements, as well as implementing selection programmes with a holistic view on performance for cosmopolitan, local or cross breeds, is seen as one of the opportunities to improve cattle efficiency and resilience in grass-based* systems (see Box 8). It is important to select breeds which are most adapted to the environmental and climatic conditions in the regions. Some examples of local breeds used in such systems are Busha cattle in southern Balkans, Podolian cattle in norther Balkans, Asturiana de la montaña in northern Spain and Maremmana cattle in the Mediterranean area. These local breeds are more adapted to the plant species under the given pedo-climatic conditions and more resilient to the environmental conditions of the region.

Box 3 – Life + Herby®: Dynamic Rotational Grazing

The objective of the Herby® Life project is to test Dynamic Rotational Grazing (DRG) and to measure its technical, socio-economic and environmental effects through large-scale participatory experimentation involving more than 120 farmers over a period of six years. The 4 principles of DRG are: never leave the animals for more than **3 days** on the same paddock, wait until the grasses have had time to grow back **3 leaves**, take the animals out before they graze the **grass stems**, and adapt the **time of retur**n of the animals in a paddock to the time of grass regrowth.

The project results indicated that in a suckler system, the impact of Herby® grazing on the growth of calves staying with their mother depends on the calving period. For spring calves, their weights at 120 and 210 days were greater than when not using DRG. The difference with the calves in the non-DRG system is solely due to the quality and quantity of grazed grass, as none of the groups of cow with calves received any supplemental feed, whether they were taken to Herby® pasture or not. At the level of suckler cattle farms, an increase in Herby grazing led to a decrease in costs for pasture area as well as a decrease in fuel costs.

BARRIERs ⇨Rotational grazing could be destructive for ground-nesting birds and may not work as expected in marginal pastures (e.g. coastal meadows) where it would be expensive and time-consuming without actual biodiversity benefits. It also requires initial investment.

https://www.life-ptd.com/

Box 4 - Voisin Rational Grazing (Pastoreo Racional Voisin-PRV)

The nutritional quality of grass which is grazed or cut at the optimal time is higher, providing better and steadier nutrition and health for herbivores, and ultimately more profit to farmers. Optimum nutritional quality of grass is attained when the desired plants have reached their "Optimum Rest Period (ORP)". A plant grazed at that point will offer best nutrition and then best regrowth capability. The Voisin method involves selecting which are/is the preferred grass species and observing their growth in order to put the cattle in the paddock that is closest to ORP at each moment. This means "the art of jumping", going for instance from paddock 3 to 7 to 1 to 15 based on the ORP in each paddock. This type of management is most suited to continental climates and best achieved by installing semi-permanent fencing, subdividing the land in at least 60 paddocks with pathways that connect all paddocks and water points in the paddocks.

Pereira et al. (2020) ⇨ "The optimum recovery period not only implies a pasture with better nutritional value and higher biomass yield but one that also reduces the production of enteric methane (CH4) to improve the grazing efficiency of cattle. The study findings suggest that the pasture growing for 24 days had the highest biomass production, best nutritional value, best efficiency of in vitro CH4 relative emission (ml) per DM degraded (g) and bite rate of the three RPs. The study's findings support the idea of management intervention to increase the quality of grazing systems." [1]

www.agriculturaregenerativa.es/pastoreo-racional-voisin-prv/

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Box 5 - Inno4grass – practical tools and experience for grassland management

Inno4Grass is a EU funded thematic network sharing experiences from innovative grassland cattle and sheep farmers from 8 countries. The project developed an educational resource bringing together much of the knowledge collected: **Grasslands in Europe; a syllabus for young farmers**. They also contributed many practice abstracts describing practical approaches to grassland management and feeding cattle and other herbivores using local grassland resources to the **Encyclopedia pratensis**, an online encyclopedia on grasslands and forage crops. One of these highlights the experience of a farmer on a pilot farm who determined the grass growth with simple grass shears and a manual plate meter once a week during the last grazing season. He mentioned that measuring grass trained and corrected his measuring with his eyes, which was what he used to do. It is important to determine the grass growth in kg dry matter per hectare rather than centimetres. The data is a strong and objective basis for decision-making on pasture and in the shed. Information about grass growth is necessary to quantify any supplementary feeding. Furthermore, the farmer gets a good overview on temporal grass development. Trends can be quickly identified, so that management adjustments can be made.

BARRIERs ⇨ A high expenditure of time for manual measurement tools (shears, manual Plate Meter). Data need to be transmitted in a database, which is only available in English language. Digital tools such as a digital Rising Plate Meter or Grasshopper would mean higher costs.

https://www.encyclopediapratensis.eu/product/inno4grass/practiceabstract/measuring-tools-for-grass-growth-on-pasture/

Box 6 –– Pasturebank

Pasture Bank is a free online tool where users can either search for additional (mostly semi-natural) pasture for their animals or for farms which do not have animals users can find animals which could use their land as pasture. It is also possible to find contact information of environmental entrepreneurs for both pasture and animal care and farm services.

→ The aim is to increase contractual cooperation that benefits both parties. Natural pastures provide inexpensive fodder to livestock breeders, while grazing animals could support pasture biodiversity and soil health and prevent forest fires if well-managed.

→ The main customers are beef producers who need more pasture area and are interested in the agri-environmental subsidy for grazing semi-natural grasslands.

SUCCESS FACTORS ⇨ Communication of the tool and experiences is key to success to attract more non-grazed semi-natural grasslands owners and beef farmers.

www.laidunpankki.fi

Box 7 - Innovative Precision Livestock Farming Tools for extensive beef production

Many different precision livestock tools are being developed which could be of use to farmers grazing livestock extensively. These include:

→ Tools allowing livestock farmers to create `Virtual fences` by drawing "safe areas" on a map of the grazing area in an app, and adding an indication when to be alerted, for instance if livestock strays beyond a certain boundary. Location trackers which provide the exact location of the livestock and the route taken in the last 24 hours from mobile phone and anywhere in the world.

→ Activity trackers to monitor daily activity of the livestock and receive indicators on the animal's activity and health.

→ Location history monitors to identify the best pastures or the ones that the cattle like the most.

DRAWBACKS ⇨ These tools could increase cost, could be complicated if different tools are not linked with one another. They could also result in decreased personal contact with the animals.

Examples include: **https://ec.europa.eu/eip/agriculture/en/news/inspirational-ideas-sports-apps-dairy-cows** - **https://digitanimal.com/** - **https://ec.europa.eu/eip/agriculture/en/find-connect/projects/planeringsverktyg-f%C3%B6r-renn%C3%A4ringsf%C3%B6retag** - **https://ec.europa.eu/eip/agriculture/en/find-connect/projects/utvecklingsprojekt-f%C3%B6r-%C3%B6kad-anv%C3%A4ndning-av-dr%C3%B6nare**

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Box 8- Beef Genomics Programmes

The Beef Data and Genomics Programme (BDGP) is one of the sustainability actions for Irish agriculture. A centralised database is key to the programme with data feeding into a genomics-based index communicated through a euro star rating system. Animals are ranked according to their efficiency on a scale of 1 to 5 with 5 stars being most efficient. The inclusion of genomic data ensures a superior predictor of future performance and identifies areas for improvement. The objective is;

→ to improve the genetic merits of the national beef herd through the collection of data and genotypes of selected animals which will allow for the application of genomic selection in the beef herd and,

→ to lower the emission intensity by improving the quality and efficiency of the national beef herd. → The aim is to increase contractual cooperation that benefits both parties. Natural pastures provide inexpensive fodder to livestock breeders, while grazing animals could support pasture biodiversity and soil health and prevent forest fires if well-managed.

www.agriculture.gov.ie/beefschemes/

4.1.2 Success and failure factors

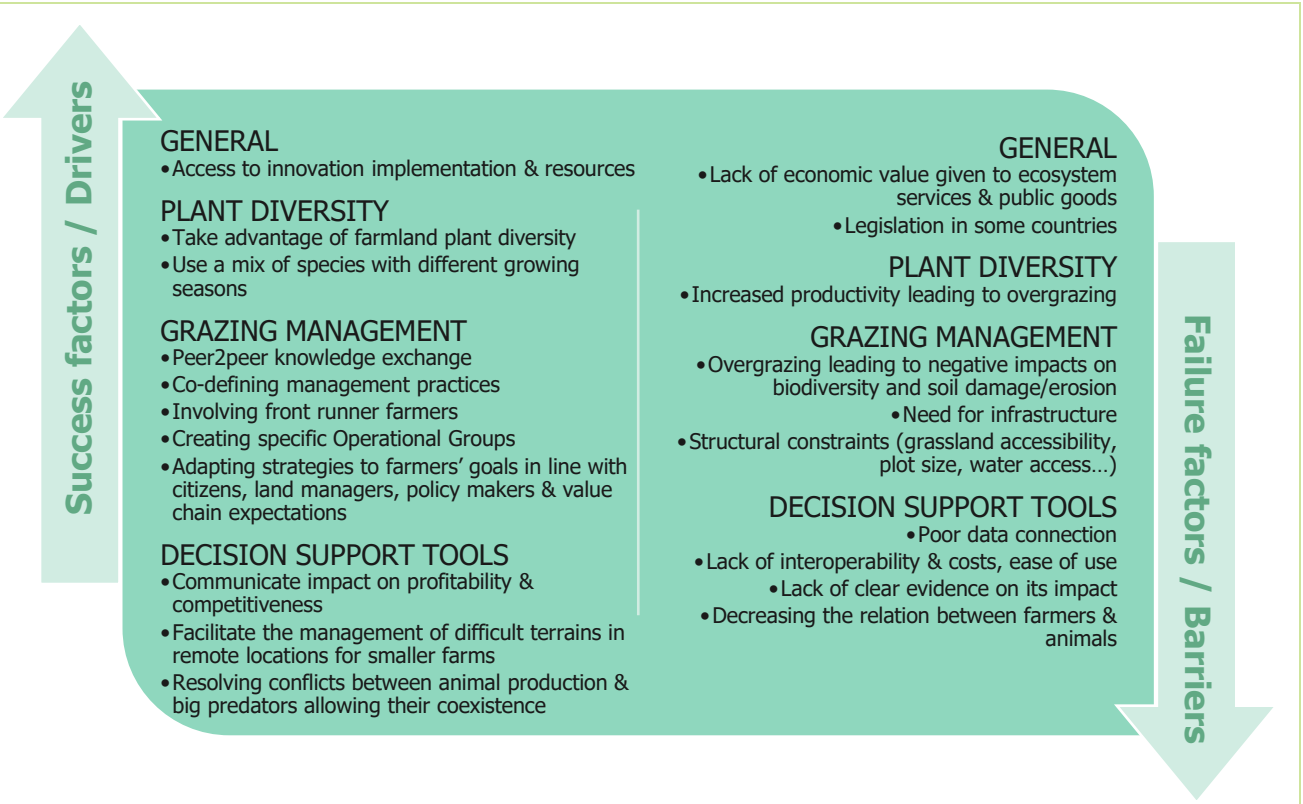

Figure 1 Success and failure factors of enhancing farm performance to support the sustainability of the current grass-based* beef systems

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4.2 Chain development

4.2.1 Key issues and good practices

The experts identified the following important bottlenecks for marketing of grass-based* beef products: lack of value chain development at local level, the reluctance of the supply chain to recognise and to label or declare the different added values that different production systems of beef hold. Grass-based beef farmers generally have low volumes, and they are far from the buyers for large chains. This combination can make it difficult for farmers to negotiate for a fair compensation of the added value of their product. Grass-based* beef farms are often small-scale and spread over a large geographical area. This creates difficulties accessing the mainstream market both from a logistics and supply point of view. These farms also encounter challenges in entering local markets due to a lack of necessary resources to develop farm gate sales, unwillingness to do so or to compete with other beef systems in local markets.

Key issues and related good practices are summarised below (see 6.2 Mini paper n°2: Chain development *"How do we bring sustainable meat from pasture to plate?");*

- *Local abattoirs and butchering facilities* are very important for the survival of small-scale grass-based* beef farmers in certain contexts. They also have a role in increasing animal welfare by avoiding the need to transport live animals to distant abattoirs, thus decreasing stress levels.
- *Killing in the field or on the farm using mobile slaughterhouses* could help overcome the problem of decreasing numbers of local abattoirs in particular in remote areas as long as food hygiene and safety, farmer and worker health and safety rules are applied (see Box 9).
- The current classification of animal carcasses by the mainstream market outlets is based on characteristics which do not reflect the specific quality classes of carcasses from grass-based* beef systems. Therefore, it would be beneficial to set up an *alternative carcass classification scheme* for beef produced under other systems than conventional intensive ones by taking into account the diversity of breeds used in grass-based* beef systems together with the regional differences in feeding regimens/varieties in pastures. The Slow Food movement and its high-quality beef criteria based on extrinsic[4] qualities is a good example of alternative classification systems (see 6.2 Minipaper n°2: Chain development Section 3).
- There is a need to *diversify or shorten the supply chain* to increase the involvement and influence of the producers in the chain (from slaughtering to marketing). This could mean creating shorter supply chains in forms of *farm gate sales* but it could also be achieved through other forms of collaboration. However, it is crucial to bear in mind all the cost items and availability of necessary resources, skills, facilities and services such as extra labour, training on handling and processing, accountancy, buildings, abattoirs, processing, and transport in case of deliveries. Farm gate sales could be promoted through both social media channels and *web-based sales* allowing farmers and consumers to communicate directly with each other? (see Box 10).
- The grass-based* beef products could also be sold through public procurement, thus *strengthening local production chains*. A group of producers acting together may find it easier to meet the demand for larger volumes requested by retailers, public procurement or supermarket-chains. In some parts of the EU, there is evidence to suggest an increasing demand for sustainable and organically labelled food in schools, day-care centres, hospitals, retirement homes and other public kitchens which puts pressure on local *public procurements,* and this could favour grass-based* beef systems.
- By *forming partnerships or other collaborative arrangements* which include producers and could also include other chain actors, producers could build up their own markets locally by communicating directly with citizens, creating a demand for their products from niche markets such as hospitals, schools, restaurants, hotels, and local supermarkets. Developing local collaboration with consumers, restaurants and supermarkets could also help raise awareness on high-quality beef and its marketing, eventually leading to developing local food supply chains.
- However, in order to ensure the economic sustainability of grass-based* beef systems and prevent it from only existing as a niche product, it is crucial to also enter into the mainstream market. This can be done by creating *new collaborations with downstream chain and market actors* to *develop new products* and gradually increase the quantities supplied. In such cooperation, the characteristics of grass-based* beef

[4] Intrinsic qualities consist of the characteristics of the product itself (taste, smell, flavour, colour, palatability), while extrinsic qualities refer to external characteristics such as sustainability, environmental impact, animal health and welfare, public health. [3]

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products such as lower production quantities, seasonality of supply, different maturing durations and cost of production, need to be clearly communicated beforehand in order to develop a successful relationship (see Box 11). Adding value to grass-based* beef by encouraging downstream supply chain actors to pay premiums based on extrinsic quality attributes would not only increase prices paid to farmers but would also contribute to the transformation of the current production systems to more sustainable ones.

- *New export markets* could be sought for high-quality premium grass-based* beef products.

Box 9 – Schlachtung mit Achtung (Slaughter with Caution)

This German company located near the Black Forest owns mobile abattoirs, which plays an important role in shortening the supply chain, in particular for small farmers. It also helps improve animal welfare and product quality. They slaughter the Hinterwälder cattle of grass-based beef farmers in the region, paying premiums for horned animals of the breed, thus avoiding any unnecessary dehorning.

One week before slaughter, the cattle are fed at a "catching unit" at the stable or pasture, and they get used to feeding in this way. On the day of slaughter, the animal is stunned while eating. A conveyer belt quickly transports the animal into the mobile slaughter unit where in 60 seconds the animal is killed by the trained personnel. This system avoids long distance transport of live animals and the release of stress hormones. Following cold chain transport to the slaughterhouse, the carcasses are cut and the meat is packed using ecological and compostable packaging. The company has a web shop to sell both fresh and frozen beef products, as well as other sales locations such as local butchers and restaurants.

https://www.sma-fleisch.de/

Box 10 - REKO

REKO is a retail and distribution model offering customers a way to order products directly from the producer, without the need for intermediaries. It runs Facebook groups through which orders and deliveries are arranged. The producer brings the pre-ordered produce to an agreed place, day and time and hands it over to the customers who have already paid electronically. REKO has in a very short period become a great success in bringing producers and consumers together, and at the same time created local networks and logistics for locally produced food. Social media direct sales have become quite popular also in Finland and Canada, especially during the Covid-19 pandemic.

SUCCESS FACTORS ⇨ User-friendly platform to connect producer with consumer and transparent information.

www.facebook.com/groups/rekosverige/ - **https://aitojamakuja.fi/en/what-is-reko/**

Box 11 - Schwarzwald Bio-Weiderind

This producer organisation in Baden-Württemberg directly provides products to the supermarket chain with a bottom-up marketing strategy by farmers cooperating to sell local high-quality beef. The strategy enables the direct negotiations between farmers and market thus attracting new farmers, increasing economic sustainability of the farms and acceptance by the consumers.

FAILURE FACTOR ⇨ The demand from retail is higher than the production capacity of the producers which might affect the cooperation and/or production systems.

https://www.schwarzwald-bio-weiderind.de/

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4.2.2 Success and failure factors

Figure 4 Success and failure factors relating to chain development to support the sustainability of current grass-based* beef systems

4.3 Certification, labelling and branding

4.3.1 Key issues and good practices

One of the bottlenecks for adding value to niche beef products from grass-based* beef systems is the difficulty to differentiate the grass-based* beef products from other beef products. Making use of marketing tools such as certification labels and brands can encourage farmers to apply more sustainable farming practices, to raise awareness about different production methods for the entire supply chain and to provide transparent information to consumers.

Key issues and related good practices are summarised below (see 6.3 Minipaper n°3: Certification, labelling and branding *"The role of certification schemes, labelling and branding for aiding the transition to sustainable beef production in Europe"*)

- *Creation of a definition* for grass-based* beef systems to be integrated to the national or European legislation in order to enable fair-trade and transparency for genuinely sustainable production methods, preventing green or grass washing.
- *Certification schemes* and *labels* could be very useful for closing the communication gaps between farmers and consumers, helping to build trust and increase demand for more sustainable products. They could also be very useful in addressing unjust and misleading product attributes (`grass washing`) by providing transparency in product differentiation.
- *Development of brands* for products from systems based on agroecological principles with *clear labelling* providing information on region, farm, production system, breeds, environmental footprint, animal

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welfare and health, food safety, ecosystem services, cultural services such as agri-tourism would not only make these quality products more appealing for consumers but also contribute to economic viability and resilience of ecosystems (see Box 12,Box 13). In order to support farmers or regions to create a brand that has a market value, *branding/labelling toolkits and training programs* could be prepared by local authorities or organisations.

- *Developing new certification schemes* setting up standards for "grass-based* beef production" could increase the presence of these products in the mainstream markets. The organic certification scheme is a successful example which may provide ideas on the drivers and barriers which are sometimes encountered when setting up a specific certification scheme with a quality attribute. However, the main drawback is that certification can be quite expensive for small farms that already have difficulties reaching the mainstream markets with niche products (see Box 14, Box 15).

Box 12 - Initiative Tierwohl

With the Animal Welfare Initiative, agricultural, meat industry and food retail companies and associations are working together for more animal-friendly and sustainable meat production. This initiative focuses on pigs and poultry but can also be an inspirational idea for the beef sector. The partners are committed to expand the standards in livestock farming across the market thanks to the participating retail companies, which finance the additional expenditure. Consumers are essential for the success of the initiative; their meat purchasing decisions can support the change towards more animal-friendly husbandry.

The label of the Animal Welfare Initiative can help consumers to take informed decisions when making purchases; it distinguishes the meat products that come from a company that participates in the Animal Welfare Initiative and implements the animal welfare criteria.

SUCCESS FACTORS ⇨ Consumer awareness of additional (public) values associated with grazing on (semi)natural pastures and of animal welfare issues needs to be created with good communication techniques.

https://initiative-tierwohl.de/

Box 13 - Own farm branding

In the absence of a unified label and marketing channel, several farms in different European countries which are specialised in suckler cow production have developed their own labels to use in direct sales channels and networks of loyal customers. These farms frequently run public relations events to promote their brand of high-quality products and communicate about public goods and animal welfare issues. This therefore increases the value of grass-based* beef. These brands base their value on consumer trust.

SUCCESS FACTORS ⇨ Consumer awareness of additional (public) values associated with grazing on (semi) natural pastures and of animal welfare issues needs to be created through the use of effective communication techniques.

Finnish example: https://bosgard.com/ - http://www.morby.fi/ - http://koskis.fi/

Box 14 - Pasture Beef Certification Scheme

When a nationwide food chain, the "Coop", decided to adopt the certified Swedish Pasture Beef as part of their top of range meats, sales, the number of certified farms and payments to farmers increased. Coop has been stocking this type of certified beef for more than a year and they are increasing the volume slowly so that the producers can keep up with the sales. The certifier is the Swedish Seal of Quality. Coop's interest was built with tenacity and networking over many years. The certification scheme existed locally for nearly 15 years before it was launched nationwide by Coop food chain in 2019.

BARRIERS ⇨ The cost of certification for the farmer should be lower. There is a lot of extra documentation involved.

www.sigill.se - www.naturbete.se

funded by European Commission

Box 15 - Liivimaa Lihaveis – State Certified Grass-Fed Beef Nordic Meats

This initiative connects around 50 farmers raising organic grass-based* beef cattle in the Baltic grasslands which contain more than 70 plan species per square metre. Liivimaa Lihaveis has created a government-certified quality scheme – ensuring the welfare of the animals and maintaining biodiversity in the grasslands. Moreover, every member of the initiative is a certified organic producer. In addition to animal welfare, the initiative also advocates for sustainable agricultural policies.

The quality scheme "Grass-fed" promotes the grazing of Angus, Hereford, and Simmental breed cattle in organic-certified farms with specific grazing management techniques and quality criteria for the meat. They also have educational videos on butchering and preparing. This initiative is also eligible to use the `promotion signature` ENJOY, IT'S FROM EUROPE.

~~http://grassfedbeef.eu/~~ - http://liivimaalihaveis.ee/

4.3.2 Success and failure factors

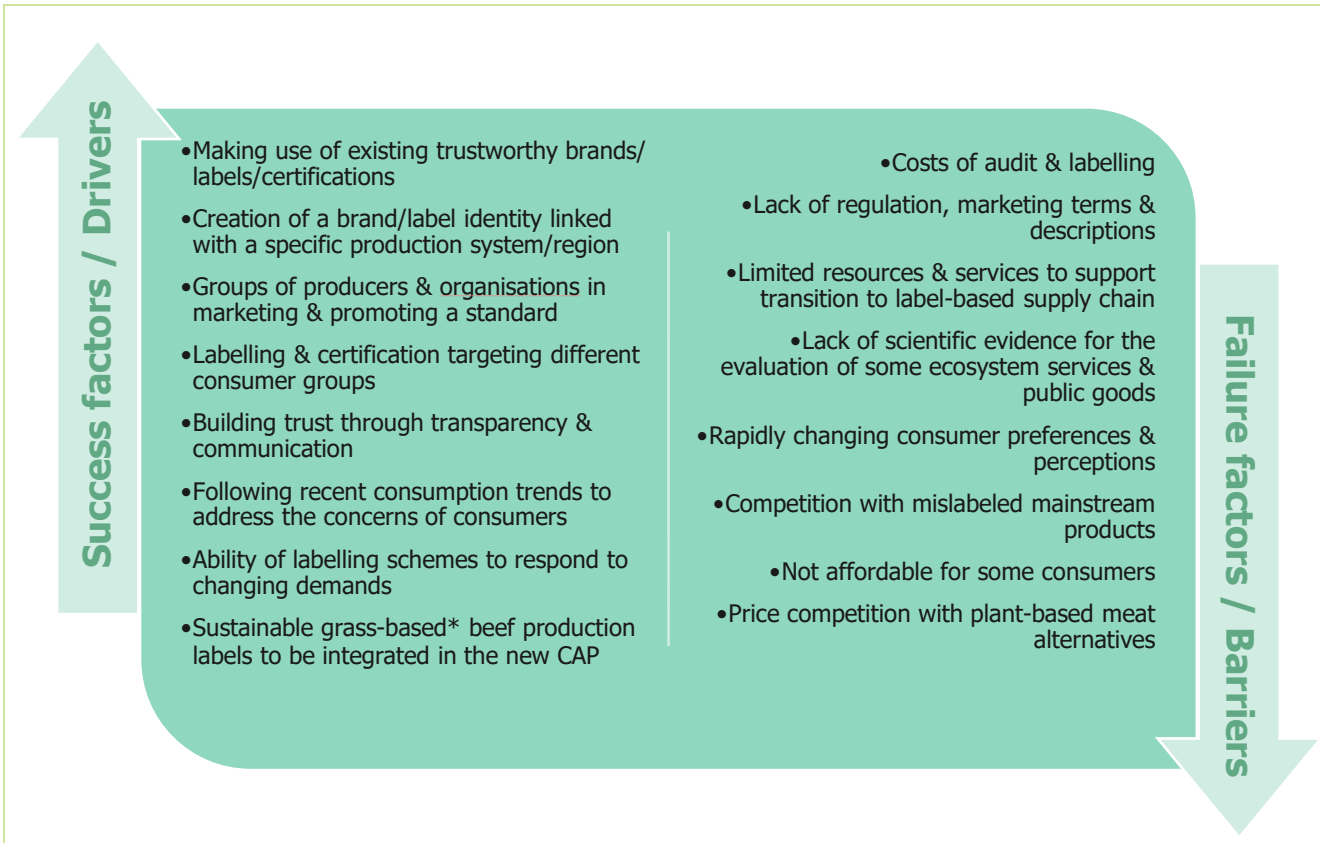

Figure 5 Success and failure factors of certification, labelling and branding to support the sustainability of the current grass-based* beef systems

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4.4 Knowledge exchange systems

4.4.1 Key issues and good practices

The success of many good practices and innovations depends very much on how the farmers and the sector's professionals can access and make use of them. One of the most important tools to increase uptake of innovations and good practices, and to motivate and mobilise the transition to more sustainable systems, is to create networks to disseminate the results of good practices and facilitate knowledge exchange between farmers (peer-to-peer) and between farmers and other relevant actors.

Key issues and related good practices are summarised below (see 6.4 Minipaper nº4: Knowledge Exchange Systems *"Knowledge exchange systems for sustainable pasture- and grass-based* beef"*)

- *Agricultural Knowledge and Innovation Systems (AKIS)* are defined as the combined organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields[5]. A well-functioning AKIS ensures knowledge exchange between farmers, advisers, supply chain actors, researchers and other relevant actors. This will help speed up innovation, avoid duplication of efforts and save costs, and strengthen the impact of EU and national/regional funding. It will be important that all national AKIS also target grass-based* beef production systems which is currently not the case in many countries as there are still relatively few. However, the grass-based* beef systems across Europe could significantly benefit from well-functioning AKIS at different levels i.e., supranational, cross-border, national and regional level.
- Other initiatives facilitating *Knowledge Exchange* are needed in order to cover more specific issues related to grass-based* beef systems, specifically the issue of maintaining grazing skills and other traditional practices. Creating new networks enabling peer-to-peer knowledge exchange supported with farm visits and regular group meetings would increase the sharing of experiences and knowledge both within and between regions stimulating farmers to improve the overall performance and economic viability of the grass-based* beef systems (see Box 16).
- The FG experts emphasised the need for *creating new networks* between researchers and the actors of the beef sector. This would enable practice-oriented, multi-actor and transdisciplinary research (see Box 17, Box 18). BovINE Beef Innovation Network Europe, which focuses on the economic, environmental and social sustainability of the beef sector, provides a knowledge exchange platform for different types of actors across the whole European beef sector (**www.bovine-eu.net**).
- Field-based studies to evaluate data to understand the impact of different management practices on ecosystem services would in return provide science-based tools for farmers and farm advisers to evaluate their farms and provide opportunities to use *benchmarking* as a management tool (see Box 18, Box 20). Making use of innovative communication and dissemination channels based on the *digital technologies and internet* such as online platforms, social media channels and instant messaging applications could increase interaction between farmers both from the same region and nationally or even internationally. The FairSHARE project, which is developing digital tools for farm advisers has useful resources for this (**www.h2020fairshare.eu**). Providing farmers and farm advisers with easy-to-access collections or bookmarks of good practices, innovations and case studies would enhance knowledge transfer from research to practice or peer-to-peer.

[5] Article 102 (a) of the Commission proposal for a Regulation of The European Parliament and of the Council establishing rules on CAP Strategic Plans, **https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A392%3AFIN**

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Box 16 - The Rangeland Rummy

The Rangeland Rummy is a serious game including a board, cards, and a computer model intended for groups of pastoral farmers facing similar issues like how to set up a grass-based beef farm, climatic hazards, change in pastoral resources, etc. An agricultural consultant assists the farmers in the game, which provides useful information to design, evaluate, and discuss pastoral strategies.

In rangeland-based farming systems, grazing management provides the adequate diversity of pastoral resources over time to each animal group. It takes into account the context in which plants and animals are constantly adapting to the highly seasonal and variable environment.

SUCCESS FACTORS ⇨ Farmers use their ecological knowledge which they enrich through direct observation of the agroecosystem and discussion with other farmers.

lifemilouv.org

Box 17 - Commonland

Since 2013, the Netherlands-based NGO Commonland has worked to build a concept that brings farmers, landowners, entrepreneurs, communities, nature organisations and legislators together to create real returns on investment per hectare. As initiator, catalyst, and enabler of large-scale and long-term restoration initiatives in different parts of the world, Commonland is on a mission to transform degraded landscapes into thriving ecosystems and communities based on sound business cases and aligned with international policies and guidelines. This framework is called "4 Returns" and is capable of initiating, organising, and following through on large-scale and long-term restoration initiatives that integrate ecology, land use and business.

→ Commonland brings a holistic approach to landscape restoration. The international team of specialists offers its partners a wide range of support tools, advice, guidance, and global network to maximise the 4 Returns framework at scale.

→ The first step in landscape restoration is co-creating a common vision for the landscape. These landscape vision quests with farmers, landowners, local NGOs, governments, and entrepreneurs raise awareness amongst all and generates engagement.

→ 4 Returns Labs that bring people from different backgrounds and motivations together aim to seek out the root causes behind problems and explore new ways of collaboration.

→ Co-creation mapping sessions bring together all local landowners and land-users to implement a common vision in the landscape. The mapping takes into account 4 Returns and 3 Zones to define priorities and first activities such as natural carbon sequestration through tree planting and regenerative agriculture, water catchment restoration and conservation. It fosters the exchange of knowledge through trainings and workshops.

→ Commonland is currently prototyping an online community platform called 4returns.earth. This online space caters to a growing global community of practitioners and other professionals involved in large-scale landscape restoration projects using the holistic 4 Returns framework that shares ideas, tools, publications, events, and stories. The platform also currently offers two Massive Open Online Courses (MOOCs) via Coursera.

SUCCESS FACTORS ⇨ Changing the mindset of farmers and others in the value chain to explain that better soil contains much more greenhouse gasses and water, and the quality of grass is getting better.

www.commonland.com

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Box 18 - Beef from the grasslands of the Gaume region

In extensive forage-producing regions of Wallonia, in particular those where remarkable biodiversity has been recognised by the Natura 2000 network, there is a convergence of environmental objectives with agricultural interests and with the development of the land. This however requires careful collaboration among the various people involved. The Jurassic region of Belgium is subject to pedo-climatic constraints which limit the level of intensification of livestock farming. One quarter of the territory is classed as Natura 2000.

The collaboration of farmers, citizens, naturalists, and scientists brought about the development of specifications for the production of 'Boeuf des prairies gaumoises' (i.e., Beef from the grasslands of the Gaume region) which only excludes highly specialised breeds such as the Belgian Blue and the Holstein.

A strong environmental constraint could thus lead to a reinforcement of the land's identity and to a possible value increment for the cattle farmers.

SUCCESS FACTORS ⇨ The identification of the interests of the different actors involved and of their perceptions, as well as the prospection of possible production schemes for the farmers with the study of their profitability needs to be taken into account.

http://gaumefermiere.com/ - http://gaumefermiere.com/wp-content/uploads/2014/05/Cahier-des-charges-BdPg.pdf

Box 19 - Sign-Post Demo Farms

Teagasc is setting up "sign-post farms" as examples of best practice in Ireland in terms of implementing many climate friendly practices on commercial farms like protected urea, clover, low emission slurry spreading, forestry, etc that also lead to better economic performance. These will be shown to other farmers through farm walks, articles, videos etc. Their progression over a number of years will be followed especially on their GHG outputs.

SUCCESS FACTORS ⇨ The extra work and costs for farmers should be avoided and these good practices should also measure the economic progress over the years.

www.teagasc.ie

Box 20 - Farm benchmarking

In the UK, the AHDB Farmbench tool is available to help farmers benchmark their businesses. Farmbench is an easy-to-use online benchmarking tool that helps to identify where strengths and weaknesses lie within a farm business. This is linked to the international Agri benchmark beef and sheep network, which compares international beef and sheep costs of production.

By comparing results anonymously to farms with similar enterprises, Farmbench enables farmers to improve individual business performance and manage many of the challenges facing the sector.

The tool enables the evaluation of the performance of these enterprises, by comparing agreed performance indicators with neighbouring, local or national farmers. The ultimate aim of Farmbench is to provide the farmer with a better understanding of her/his own business. It will then be possible to discuss and share good practice with others through Business Improvement Groups, before making evidence-based decisions to improve individual profitability and productivity.

SUCCESS FACTORS ⇨ It could be expanded to include environmental sustainability to attract more farmers and increase the coverage of benchmarking.

ahdb.org.uk/farmbench

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Table 1 Identified network and knowledge exchange needs for grass-based* beef systems in Europe

Action	Topics	Impact
Enhancing farm advisory services	• Whole farm household/system enabling creation of complementary activities • Importance of hedges, stone walls, multi-species bird & insect nests, woody riverbanks, etc. as biodiversity providers and ecological corridors	➔ Increase farm performance ➔ Increase benefits of biodiversity providers such as insects, pollinators
Peer-to-peer knowledge exchange programmes and benchmarking	• Farm visits to support the conversion from conventional systems to more sustainable systems • Good farming practices and sharing experiences	➔ Increase grass-based* sustainable beef production ➔ Increase ecosystem services and farm performance
Capacity building activities for farmers and advisers	• Farm management, business models and marketing solutions training for farmers • Annual professional development programmes covering grass-based* beef production including management (grazing, pasture, herd, farm), biodiversity, nutrient management, etc. for farm advisers • Differences and applications of directed grazing methodologies like Holistic Management, Voisin Rational Grazing (PRV), Polyface methods, traditional transhumance to farmers and advisors • Targeted dissemination of research results to advisers and farmers	➔ Strengthen the role of farmers in supply chain by empowering them ➔ Improve the quality of the farm advisory services ➔ Improve farm performance and ecosystem services ➔ Improve farm management
Network development	• International network of professionals and experts • Landowners ↔ farmers • Farmers ↔ processors, advisers, retailers, consumers • Government ↔ private sector initiatives c • Research ↔ farmers	➔ Increase knowledge exchange among European regions ➔ Enhance beneficial cooperation ➔ Encourage sustainable practices providing public goods ➔ Co-design extension strategies ➔ Co-define quality with value chain actors ➔ Uptake of research results ➔ Increase participation and influence of practice in research
Sustainable production education for future professionals in the food supply chain	• Sustainable systems education for high-schools, vocational and higher education to train future professionals (producers, advisers, breeders, retail and food processing professionals, etc.)	➔ Create a sustainability mindset in new professionals

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4.4.1 Success and failure factors

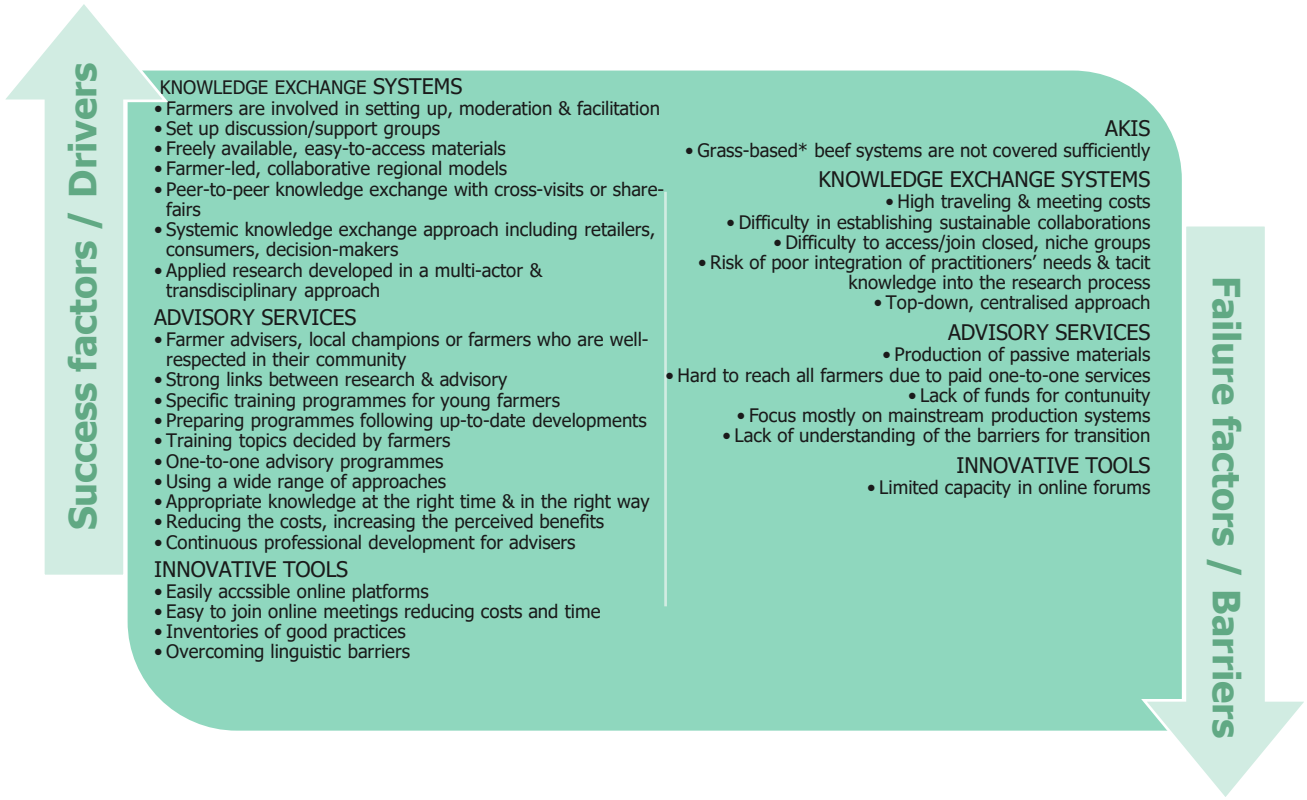

Figure 7 Success and failure factors of creation of new networks and cooperation for supporting the sustainability of grass-based* beef systems

4.5 Communication with consumers

4.5.1 Key issues and good practices

During the FG meetings, it became clear that there is insufficient communication between consumers, stakeholders and society which results in a lack of knowledge and awareness about grass-based* beef production systems, the products derived from them and the attributes valued by consumers. The latest findings of the Eurobarometer consumer expectations survey on food purchases indicate that 61% of EU citizens are concerned about being misled about the true qualities of a food [2]. It is therefore critical to contribute to the debate about the role of cattle production, and grass-based* systems in providing sustainable diets[6] with evidence-based knowledge and facts.

Key issues and related good practices are summarised below

- The success of a communication strategy is based on *identifying the right messages* that are tailored to targeted stakeholders or specific consumer groups. FG experts have set up "The Message House" for grass-based* beef under the overarching statement "Grass-based* beef is a quality product" that is supported by 3 pillars: natural, healthy and premium.

[6] Sustainable diets are diets with low environmental impacts that contribute to food and nutritional security and to healthy lives for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable, are nutritionally adequate, safe, and healthy, and optimize natural and human resources [7].

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- New network models involving the local community, consumers, citizens, health professionals, teachers or other professionals or influencers that are trusted by the target audience are needed to enable the creation of more *communication pathways* between the farming community and the public (see Box 21). This would not only make the production system more transparent but would also create an awareness of the ecosystem services and public goods the grass-based* beef products offer.
- It is quite important to communicate on the *other benefits and ecosystem services* grass-based* beef production provides through direct interaction with citizens and other market actors (see Box 22).
- Grass-based* beef systems across Europe could also *make use of the AKIS* to start a dialogue with consumers and citizens.
- *Other marketing activities* are also very important for connecting with consumers and building trust. Using different marketing tools to inform consumers about grass-based* beef and its main differences from conventional products, and the "less is better" philosophy, is key to increase credibility, avoid misinformation, support transparency and move beyond local/niche markets (see Box 23).

Box 21 - Agri Aware Mobile Farm

The Mobile Farm is a unique outdoor classroom that is used to educate children and adults via a hands-on learning experience. The Mobile Farm unit safely and humanely transports animals to any school, company, or event. The aim of Agri Aware's Mobile Farm is to educate young and old about the different farm animals on Irish farms and their role in producing quality food that is safe and affordable for consumers.

www.agriaware.ie

Box 22 – Pasture for Life

The Pasture-Fed Livestock Association has been active in the sales and promotion of the wide-ranging benefits of pasture-based beef since 2009. They have been working on informing consumers on the benefits to the environment such as lower carbon footprint, chemical-based fertiliser free production and ban on soya feeding to prevent further destruction of tropical forests. Their positive message to do so is "Pasture farms are alive with wildlife including many flowers, insects, birds and mammals." They also provide findings of research projects supporting their messages.

https://www.pastureforlife.org/why-pasture/better-for-our-environment/

Box 23 – Slow Meat campaign

Slow Food has started the Slow Meat campaign which aims to raise awareness about better, cleaner, fairer consumption habits, to encourage a reduction of industrial meat consumption and to promote the work of small- and medium-scale producers who respect animal welfare. Slow Food has also introduced sustainable livestock farms which follow strict production rules and they inform consumers that by buying meat from these farms they are contributing to biodiversity-preservation and animal welfare. The campaign also uses farmer stories to create a direct link with consumers.

https://www.slowfood.com/what-we-do/themes/slow-meat/slow-meat-sustainable-livestock-farming/

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Figure 2 Identified network and communication needs for grass-based* beef systems in Europe

Action	Summary	Impact
Information programmes and campaigns relating to ecosystem services and public goods provided by grass-based* beef systems for consumers and citizens	Information programmes to explain the positive influence of sustainable beef production on the environment, cultural heritage, and animal welfare. Local initiatives to connect farmers with consumers and organising farm events and sharing real life stories is very effective in creating bonds.	Increasing consumer and citizen awareness, and willingness to pay for quality and services
Empowering consumers	Co-definition of quality, to objectify the intrinsic and external attributes for a clear communication message	Targeted certification and marketing to valorise quality beef products
Outreach to urban population, students, young generations	Promotion of sustainable livestock production and integrated food systems among pupils in primary schools, especially in urban areas through interactive games to make them conscious of the impact of their food choices on the environment and the climate.	Increased awareness of the multiple impacts of food choices, and the trade-offs involved
Communication with consumers and citizens	Provide objective and transparent information on ecosystem services and the value of natural capital with clear messages indicating the benefits of grass-based* beef products such as "less but better", "from nature to nurture" …etc	Raise and increase public awareness and valorisation of public goods
Increase interaction with media	Reach out to society by attracting the attention of mainstream media channels, social media influencers and well-known cooks, and run campaigns for grass-based* beef systems	Increase awareness of quality attributes of grass-based* beef

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4.5.2 Success and failure factors

Figure 9 Success and failure factors for the creation of new networks and cooperation to support the sustainability of current grass-based* beef systems

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5. What can we do?

5.1 Ideas for Operational Groups

EIP-AGRI Operational Groups (OGs)[7] are financed under the Rural Development Programmes and bring together farmers, researchers, advisers, environmental groups, agri-businesses and NGOs to identify innovative solutions to particular challenges facing the agri-food sector and rural economy. At present, several OGs dealing with innovation in beef production have been supported in several Member States.

The FG experts developed twenty ideas for Operational Groups (OG) and possible innovative actions. Six were further elaborated. The selected OG ideas are categorised under the main 6 themes below. The remaining ideas are found in **Annex 4**.

5.1.1 Enhancing farm performance

IDEA 1: Promoting mixed systems to improve sustainability of beef production systems "Back to the Future"

Addressed problem	Beef production is often criticised, notably for its negative impact on the environment. However, it produces high value proteins through the utilisation of resources that are not edible for humans (grassland, crop by-products and residues) and it delivers numerous other ecosystem services. In addition, the high costs and increasing competition for land means that starting or expanding beef enterprises can be challenging. Integrating beef enterprises into arable rotations provides opportunities for both beef producers and arable farmers.
Solution to be tested/ investigated	Reconnecting crops and livestock in a more circular system In the development of more agroecological systems, grass-based* beef systems support important services such as soil fertility maintenance, pollinator activity, weed control...etc ▶ *Development of a stronger interconnection between beef and crop production systems* (within the same farm or between farms of different types at a local/regional level) in mixed systems is important. ▶ *Identification of barriers and solutions for cooperation between farmers* to exchange animals/manure etc. to support a circular bioeconomy. This would support an increase in soil fertility and reduce inputs needed in each system and, therefore, reduce the associated negative externalities such as food-feed competition, inputs derived from fossil-energy use, nutrient run-off, landscape simplification, pest and pathogen pressures… ☞ The concept of Ecological leftovers provides some foundation to this OG. **https://ec.europa.eu/environment/integration/research/newsalert/pdf/ecological_leftovers_route_to_sustainable_diet_450na2_en.pdf**
Participating groups	Mixed livestock-cropping farms or interconnected specialised farms, advisors, researchers, cooperatives, agricultural contractors

[7] https://ec.europa.eu/eip/agriculture/en/eip-agri-operational-groups-%E2%80%93-basic-principles

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IDEA 2: Increase the diversity of sward species to increase productivity and improve the resilience of grasslands

Addressed problem	The changing rainfall trends, rising temperatures, extreme weather events and emerging diseases challenge the resilience of grassland agroecosystems. This underlines the need to pay attention to alternative species' mixtures to renew grassland swards in order to maintain their productivity. However, there is a lack of information on which species mixtures perform best under different circumstances (soil type, agro-climatic conditions, establishment method, sward management, etc.).
Solution to be tested/ investigated	▶ *Increase the inter- and intra-paddock diversity* in addition to internal sward species' mixture composition in order to increase the temporal flexibility of resource management. ▶ *Support farmers to compare two or more species mixes* on their own farms. • Encourage a group of farmers to compare mixes in split field comparisons. • Collect measurements from these farms to assess performance (i.e., forage production, forage quality and livestock performance) Arrange farm visits to these farms to facilitate knowledge exchange.
Participating groups	Farmers, advisors, researchers, agricultural contractors, seed suppliers

5.1.2 Chain development

IDEA 3: New business models in animal slaughtering

Addressed problem	▶ Small abattoirs in many parts of rural areas in Europe are closing. Thus, transport distances of live cattle for slaughtering are becoming longer, making access to slaughtering more difficult especially for small farmers. This also affects animal welfare. ▶ There is a gap between knowledge and practice regarding the advantages of alternative slaughtering methods and slaughtering facilities. Further testing, investigation, and most importantly facilitation to implement small abattoirs is needed.
Solution to be tested/ investigated	The OG could; 1. highlight the main reasons for the reduced number of slaughterhouses 2. develop new ideas/new business models 3. start a flagship project and identify the success factors and the challenges, which can be transferred to other potential slaughterhouses 4. support alternative slaughtering methods, bringing farmers together with local butchers, offer training on alternative slaughtering methods, working together with local authorities 5. inform the public through a strong marketing campaign about the advantages of alternative slaughtering methods and the high-quality product. ☞ The whole project could be scientifically supported with results on animal welfare, beef quality, CO_2 emissions, etc.
Participating groups	Farmers, butchers, marketing specialists, veterinarians, economists, sociologists, microbiologists/food safety experts, local authorities

funded by European Commission

5.1.3 Certification, labelling, branding & communication with consumers

IDEA 4: Coming up with ways to measure beef production sustainability is and developing pathways make beef production sustainable (as monitored via the indicators)

Addressed problem	Sustainable grass-fed producers find it difficult to sell their product at a premium price because they cannot "prove" that it is different from products from conventional systems in a manner that is valued by consumers.
Solution to be tested/ investigated	1. define and select indicators that allow sustainable grass-based* beef production models to be characterised, in order to be able to differentiate/certify meats that have added-value (environmentally, socially, economically) 2. establish and define criteria that reward good practices and their incremental take-up (reducing external inputs, promoting use of resources connected to land, grazing management, herding) 3. create clear and appealing communication campaigns around these indicators, models and standards ☞ The challenge is to define the indicators that farmers can easily measure in a cost-time efficient way and that are adapted for different systems.
Participating groups	Cooperatives, farmers, technological research centres and universities, NGOs, retailers, consumers, environmentalists

IDEA 5: Finding ways to ensure the sustainable beef production is both recognised and protected in markets and supply chains (so that citizens are able to support genuine improvement of the environment, animal welfare and their own health)

Addressed problem	It is difficult, and in some EU countries impossible, to get recognition for sustainably produced beef and ensure it is protected from false or misleading marketing claims. This creates a real problem for farmers trying to farm in a way that is better for the environment, and animal and human health, and likewise for consumers who are trying to make ethical choices. This is a problem in individual countries and on a pan-European level where cross-border trade takes place.
Solution to be tested/ investigated	1. Identify the characteristics of sustainable grass-based* beef production in different regions and develop a broad holistic framework that defines "sustainable beef" and encourages continuous improvement. ▶ farm visits, supply chain visits, retailer visits, consultations 2. Building on the good work of the EIP-AGRI Focus Group for Sustainable Beef, collaborate to pool resources, expertise and skills to develop a clear strategy for grass-based* beef production in the EU to become mainstream. ▶ meetings with farming organisations and NGOs, facilitated workshops 3. Share knowledge and networks with the European policy- decision- makers to help co-design and co-deliver the strategy and untangle or improve pinch points (such as labelling legislation and access to abattoirs) that will enable greater flow and viability for beef produced to high sustainability standards.
Participating groups	Farmers, scientists, people who understand labelling and trade rules, representatives from NGOs working in this field, supply chain actors, retailers, meat processors

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5.1.4 Knowledge exchange and network creation

IDEA 6: Integrating and setting up cooperation on management of semi-natural grasslands in forest certification schemes

Addressed problem	The decline of the acreage of semi-natural pastures is a huge threat to biodiversity. In Sweden, for instance, large forest companies are taking over more of the previously farmer-owned forest lands. When a forest company buys a family farm to get access to the forest, they tend to sell the farm buildings and farmhouses as holiday homes and plant forests on the old fields and grasslands.
Solution to be tested/ investigated	*What is needed to entice/stimulate the forest companies to act differently?* Today all forest companies have to adhere to environmental certification schemes which award points for various environmental activities on their land. Protecting and preserving the semi-natural grasslands on the company lands could lead to higher scores in these schemes. The problem is lack of knowledge, interest and above all, grazing animals, which can graze in these semi-natural grasslands. The OG could work on solving this problem by: 1. Creation of a local network of farmers with grazing animals which delivers grazing power to forest company land 2. Setting up of a company-owned flock managed by a local farmer(s) in a company owned building 3. Investigating/offering other variations on the same theme that provide grazing animals for the company grazing lands Positive outcomes: ☞ The local farmers could increase their herd size and become more economically sustainable, ☞ The forest companies would gain certification points for their production ☞ The environmental agency/county administration board would be able to reach more national environmental goals through the maintenance of larger areas of semi-natural grasslands ☞ A first-class product, certified pasture beef, could enter the local market on a bigger scale.
Participating groups	Forest companies, farmers' unions, national environmental agency, county administrative board, WWF and/or other environmental NGOs, local communities

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5.2 Research needs from practice

Topic	Research need
Pasture and grazing management	▶ *Virtual fencing:* Benefits vs potential negative effects on animal welfare and behaviour are not known. There is a need for independent research to understand opportunities and limitations of such systems involving veterinarians to manage any animal welfare implications. ▶ *Database on advised management measures on HNV pasture:* Creation of a common database which is updated regularly by latest research results on rare species and habitats and summarises the good practice examples and advises on management of sensitive habitats. This database aims to provide up-to-date information to farmers and advisers on research results to be used for pasture management. ▶ *Influence of variation of farm management on rare species and habitat types:* Natura 2000 and other protection status place a huge responsibility on the farmer to maintain the land in the same condition. Scientific research on different methods of managing sensitive habitats under different management systems is missing. Farmers are advised not to apply new methods on HNV pastures due to the risks of causing damage on rare species. However, there is a need for more knowledge about the level of risk associated with new methods and alternatives. ▶ *Optimum sward management (grazing/cutting) for different species mixes:* There are some knowledge gaps related to multispecies swards management: ○ optimal local plant species to reseed for different climatic conditions ○ effect of introducing different foreign species related to climate variability, pasture productivity, animal health and profitability ○ optimal local plant species to reseed related to weather conditions, emissions, resistance to climatic variation etc. ○ long-term effects of biodiverse swards on environmental indicators ▶ *Decision Support Systems (DSS) on quantification and estimation of grass availability in quantity and quality:* development of a DSS predicting grass availability in quantity and quality through setting up of a grass growth model and a network of meteorological stations based on grass growth observatory through the mobilisation of remote sensing observations. This would help grassland-based beef producers with resource management, potentially increasing the resilience of their systems.
Herd management, Animal health and welfare	▶ *Attaining balanced diets for cattle in harsher and arid climates:* There is a need for research on evaluation, design and preparation of a balanced diet in such harsher conditions that is still profitable to the farmers. ▶ *Impact of grazing management on animal diseases:* How do different pasture-based management techniques (rotational and managed grazing on-farm, transhumance across the region, etc) favour or alleviate the contagion of animal diseases such as Tuberculosis, parasites, etc. ▶ *On-farm animal welfare assessment in grass-based* systems:* Current animal welfare evaluation systems cover mostly intensive husbandry systems in many European countries. This presents a risk that grass-based* farms do not fit in these systems. There is a research need for an alternative animal welfare evaluation system for non-intensive systems involving researchers and professionals trained and experienced on pasture management, soil health, ecosystem relations, animal sciences, biology, nature, veterinary sciences, etc. ▶ *Development of novel technologies for pastoral systems:* Increase the development of novel technologies that are relevant to pastoral systems.

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Breeding and Genetics	▶ *Methane production variations between different breeds:* Some breeds/animals may have a naturally lower carbon footprint (produce less methane) than others or be better at conservation grazing whilst not having an adverse effect on GHG production. ▶ *Robustness and animal efficiency:* Variation between animals in feed conversion efficiency has a genetic component, allowing the selection of animals with greater efficiency. On the other hand, cattle have to be more robust to be able to adapt to environmental and pasture-based feed challenges across seasons and over different years. There is a knowledge gap on robustness and efficiency in different production systems, breeds and environments. ▶ *Adapted/optimum breeds for a pasture-based diet:* There is a lot of research potential in trying, testing and carrying out a comparative analysis of local breeds vs commercial breeds and crosses that respond well to grass-based* diets, and are productive for farmers, in terms of time to finishing, weight of carcass and quality of meat while also having good health and performance.
Farm economics	▶ *Economics of finishing beef cattle on pasture-based systems:* There is a need to test the economics of finishing beef cattle on pasture on a variety of systems, breeds and regions, its limitations and necessary interventions to understand the impact on: ○ system profitability; this is influenced by animal performance as well as acceptance of the meat produced, both along the chain and by consumers, ○ environmental externalities such as biodiversity, nitrate leaching risk, etc.
Sustainability assessment	▶ *Impact of grass-based* beef production systems on climate, biodiversity and animal welfare:* Sustainability assessment of grass-based* beef farming systems needs the development of more holistic approaches including dimensions such as GHG emissions, feed/food competition, carbon sequestration, soil fertility and biodiversity enhancement. It is therefore necessary to understand the impact of different pasture and animal management methodologies on climate, soil, water, biodiversity and animal health and welfare with a holistic and scientific methodology. ▶ *Intensify research into systemic values of keeping animals:* There is a need to understand the advantages/disadvantages of including cattle as part of agricultural production, such as nutrient cycling, grassland as part of crop rotations, mixed production, local/regional food security, local/regional rural viability, biodiversity and landscape amenity; as well as production conditions to better assess the role of grass-based* beef in a sustainable food chain and sustainability of rural areas.
Local chains	▶ *Efficiency of different on-farm slaughtering techniques:* Various techniques for on-farm slaughtering needs to be researched and tested taking into consideration food safety, economics and logistics. ▶ *Safety of on-farm slaughtering techniques:* There is not enough applied research on improving the safety of farmers and farm(workers during on-farm slaughtering which needs to be addressed. ▶ There is a need to identify sustainable short chain business models with a multi-actor approach that results in affordable, accessible, safe food for the consumers.
Meat quality	▶ *Methods to differentiate the meat quality in pasture-based systems and others:* Establishing and studying different indicators that can serve to evaluate the extrinsic and intrinsic quality of meats produced through different ways of farming and other differences between them. Enhance technologies for inexpensive and effective origin tracing which will further ease market differentiation for the premium products. ▶ *Genetics of pasture-based/low-input meat quality traits:* Knowledge of molecular aspects of meat quality will be very important to understand how the environment, genetics and development of the animal affect the meat quality attributes in beef cattle.
Marketing	▶ *Development of novel products for consumer groups with specific needs:* There is a need for novel product development from premium products targeting elderly, flexitarians etc. that are potential target markets for premium products. ▶ *Market research and Willingness-to-Pay (WTP):* A relevant part of the knowledge about grass-based* beef customers' needs and expectations has been carried out in the USA whereas the amount of knowledge about the diversity of scenarios across the EU is missing. Such knowledge could help to better attend to the current sociocultural scenario in terms of emerging diets and customers and how to use new technologies to respond to their demands.

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6. Recommendations and conclusion

FG experts formulated a number of considerations and recommendations aiming at supporting the sustainability of grass-based* beef systems. The profitability of grass-based* systems seems to be low since ecosystem services and disservices are not being taken into account. Unless the sustainability assessment covers ecosystem services and public goods and the financial support systems take these into account, uptake of good practices and good examples may not be as high as needed, thus having relatively limited effect on maintaining grass-based* systems and related ecosystem services.

- Current Life Cycle Assessments (LCAs) take into account the greenhouse gas emissions (methane (CH_4), nitrous oxide (N_2O) and carbon dioxide (CO_2)) and the number of animals on the farm which is then expressed as CO_2-equivalent per kg of meat which tends to put a focus on productivity per animal. Assessing sustainability of the beef sector should be based on applying *novel holistic assessment methods*, in order to grasp the multiple values outside of production of meat. Novel holistic assessment frameworks and tools are therefore important innovations for assessing the real value of products deriving from grass-based* beef systems.
- Implementing a systemic approach to increase the sustainability all along the food chain is facilitated by the *development of supply chains at local level* including abattoirs, butchers, processors, packing facilities, transportation and sales. This is often very difficult for producers to initiate due to barriers related to finance and expertise. Therefore, support from local communities and public authorities by means of new investments, creation of local labels, brands or certification schemes, as well as national and European policies are crucial for maintaining or transforming the sector.
- There is a need for raising awareness on sustainable beef production systems by setting up criteria that allow local municipalities to pay more for sustainable products and still remain within the law of public procurement. It is crucial that *premium products from local farmers are included in public procurements* thus promoting its evidence-based benefits on human health, landscapes, biodiversity, rural communities and keeping European traditions alive.
- *Methods and techniques for differentiating grass-based* beef from beef from other systems* need to be set up including identifying differences in both the intrinsic and extrinsic quality parameters such as carcass classification systems associated with grass-based* systems. In addition to setting up or strengthening the current certification and labelling systems specific to grass-based* beef, regulators need to ensure that consumers are not misled by preventing green- and grass-washing and misinformation of consumers.
- In order to increase the presence of grass-based* beef products in mainstream markets, good practice examples from different parts of the world should be examined taking into account success and failure factors of current certification schemes, labels and communication campaigns. *Sustainable production systems have to be in mainstream markets* for production to continue at a reasonable scale.
- For grass-based* beef production to continue, the most important factor is the presence of the farmer. Therefore, *special schemes for new entrants, young farmers and especially women, should be merged with retirement schemes* to ensure knowledge transfer as well as a soft transition for both parties. Collaborative farming arrangements such as partnerships should also be encouraged.
- Increasing the farm performance and economic performance by knowledge exchange or training programmes requires *peer-to-peer discussion groups and advisors experienced in grass-based* production systems*. Making use of farm-visits, interactive and innovative communication and brainstorming techniques and tools, development of decision support systems and precision livestock tools, using various communication channels including social media, virtual libraries, and instant messaging opportunities are key in increasing the exchange of knowledge and experience as well as the creation of new networks between different actors of the chain.
- All *research programmes should address knowledge gaps from practice* with multi-disciplinary and multi-actor teams and with a holistic approach.

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Annex 1 : Good practices and case studies

Enhancing farm performance			
Practice	**Advantages/ Success factors**	**Disadvantages/ Barriers**	**Link/Coverage**
Grassland management	Money & labour	Money & labour, legislation	http://www.encyclopediapratensis.eu/product-category/inno4grass/
Grazing management	Using cattle as a management tool in mixed farms	Nutrient management, maintain quality in grass for other ruminants	UK
Voisin Rational Grazing (PRV)	leading to economic benefits	Trade-offs between ecosystem services if not managed correctly	Italy
Dynamic Rotational Grazing	Lower feed and farming costs	Impact on animal performance depends on calving period	France
Decision support tools (DST)	Profitable, change labour type, user friendly	Poor data connection in remote areas, lack of interoperability between different DSTs	https://www.inno4grass.eu/images/dokumenty/Overall_rankings_grassland_tools.pdf https://www.super-g.eu/2020/06/23/report-on-decision-support-tools-published-d5-1/
Decision support tools (DST) based on drone, GPS, SIG and 3d Modelling	Reduce labour	Lower accuracy rate compared to manual tools	http://www.hnvlink.eu/download/Greece_3D-mappingtoolsandGPS-trackingsystem.pdf http://www.hnvlink.eu/download/TheUK_Commoners_council.pdf
Use of local breeds	Higher farm revenue through traditional breed schemes, diseases resistance	Lack of breeding programs	Europe
Crossbred cattle adapted to grass-based* systems	Diversification of production, increase use of (semi)natural grassland	Lack of local abattoirs and other supply chain actors such as meat processors, retailers etc.	Sweden

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Chain Development			
Practice	**Advantages/ Success factors**	**Disadvantages/ Barriers**	**Link/Coverage**
Mobile slaughter trailer for pigs	Mobile structure with an air conditioning and a refrigeration system, a sink for operators	Legislation in Europe for alternative methods of slaughter is not harmonized	Italy
Larger mobile abattoirs for cattle	Completely autonomous, with its own electricity, its own water and its own heating/cooling and no need for transport of live animals	Economy of scale was never achieved since distances between farms were long and farms were smaller, legislation restrictions to find solutions	Sweden
Alternative quality criteria by Slow Meat	Promoting high quality beef from sustainable production methods		Europe
Costing farmgate sales – Cambrian Mountain Beef group	All steps from production to sales are covered and compared to conventional meat sales to abattoir	Transport of meat to the customer is often very costly and difficult in terms of preserving the cold chain	UK
Online marketing	No market related waste, easy with prepaid options, knowledge of the production model, the farm and the farmers is transferred to the consumers	Sales are targeting local consumers	Finland, Sweden, UK
Links with public procurements	Creating new networks with local meat companies and or local governments/municipalities and using known brands, pressure from the consumers for better quality	Supply needs to be increased to cover the demand; public procurements are usually based on lowest price possible rather than quality	Sweden, Spain
Sustainable beef in mainstream markets	Creating new networks with retailers, long-term commitment	Meeting the demand in terms of production volumes, lower prices for farmers than farmgate sales	Sweden, Germany
Developing new brands/labels with market actors	Joining forces with large market actors to access the mainstream market	Lack of understanding of the nature of grass-based* beef production characteristics, low payments to farmers, lack of open communication between actors,	Sweden, Spain

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Certification, labelling, branding			
Practice	**Advantages/ Success factors**	**Disadvantages/ Barriers**	**Link/Coverage**
Certification scheme for meat from semi-natural pastures	Created with collaboration of different related parties	Small and fragmented areas of semi-natural grasslands in the country, consumers lack the understanding of the added value of 'natural pasture' as compared to 'pasture', misleading labels on conventional beef products	Finland
Pasture Beef certification scheme	Criteria, label and logo established with a 3rd party certification scheme, enthusiastic local producer ring with customers from influential shop owners and public procurement, top end restaurants, national retailer chains which understand the characteristics of sustainable production and its slow growing nature, supporting certification of farmers	Lack of sizeable enough economic incentive for farmers, higher premium needed to cover cost of third-party certification scheme	Sweden
European quality schemes	Consumers know the quality schemes and are aware of the production system, helps producers to face uncertainties and volatility in prices and sales		Spain
Working with known retail labels	Cooperation between retailer and farmer coops for better prices	Cooperatives need to work with trained and experienced professionals to be able to compete with other productions systems	US
Branding niche products	Development of a comparable marbling score system for grass-fed and other beef products, connecting to existing supply chain network		Australia

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Knowledge exchange systems			
Practice	**Advantages/ Success factors**	**Disadvantages/ Barriers**	**Link/Coverage**
AHDB for Beef & Lamb	easily accessible, free of charge, wide range of topics covered	Passive, difficulty in reaching to all farmers	UK, https://ahdb.org.uk/beef-lamb
TEAGASC	Discussion groups, links to research and advisory services, young farmer educations	Covers only member farms, paid services in one-to-one services	Ireland, www.teagasc.ie
Mobile advisory teams	Advisory services for remote areas	Lack of continuity	Bulgaria, http://www.hnvlink.eu/download/Bulgaria_Mobileadvisoryteams.pdf
Pasture-Fed Livestock Association	Positive and collaborative approach, regional farmer-led model	Niche and limited capacity of online forum	UK, www.pastureforlife.org
GRAPEA	Wide range of management topics, creates networks and trust in particular for transforming farmers	Current legislations are hard for farmers to keep track of	France, http://www.civam.org/index.php/component/myjspace/see/grapea
Landcare organisations	Face-to-face contact, advisory services for funding opportunities, create new networks between farmers and actors	Contradicting messages with mainstream agricultural policies	Germany, https://lev.landwirtschaft-bw.de/Lde/Startseite
Grass10 Programme	Diversity of KE approaches, benchmarking through competitions	Focus on intensive production	Ireland, https://www.teagasc.ie/crops/grassland/grass10/

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Communication with consumers and citizens			
Practice	**Advantages/ Success factors**	**Disadvantages/ Barriers**	**Link/Coverage**
Identifying key source of information for communicating to consumers	Ensuring a credible message, targeting different consumer segments	Lack of evidence for the claims	Spain, https://www.tandsbutchers.com
Improving consumers' cooking skills	Addressing consumers' concerns, overcoming price barriers by making use of all parts	Needs media support to engage	Scotland, https://meatmanagement.com/scotch-beef-and-lamb-promotion-to-1-4-million-scots-this-easter/
Targeting professionals/restaurants	Recognising sensory attribute, make use of workshops, trade fairs	Lack of interest of professionals and restaurants	Sweden & Latvia, https://ec.europa.eu/chafea/agri/en/campaigns/ delivery-information-about-grass-fed-beef-and-promotion - sweden-and-latvia
Focusing on biodiversity & landscape	Raise awareness on the co-benefits of cattle grazing and biodiversity	Lack of support by local or regional media/public bodies, lack of interest of consumers	Estonia, Ireland, http://grassfedbeef.eu/videos https://youtu.be/iTYC3EUeU2w
Regional diversity, vividness	Raise awareness on the co-benefits of cattle grazing and regional diversity/vividness	Lack of support by local or regional media/public bodies, lack of interest of consumers	Ireland & the Netherlands, https://nationalinventoryich.chg.gov.ie/winterage-in-the-burren www.commonland.com
Soil health	Emphasize connection between healthy soil and healthy people, and a link between healthy soil and healthy economics on the farm		Kiss the soil- movie (Netflix)
Animal welfare	Focusing on benefits of grazing to animal health and behaviour	Image of beef sector due to beef produced from intensive dairy farms	UK, Pasture4Life video tweets
Communication strategy based on end-user	Inclusive of multiple benefits	Identifying the most important point for end-user	Estonia

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Annex 2 : Members of the Focus Group

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You can contact Focus Group members through the online EIP-AGRI Network.
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Annex 3 : List of Minipapers

Name	Coordinator	Contributor
Enhancing farm performance	Josselin Andurand	Sarah Hughes, Jacopo Goracci, Didier Stilmant, Vladan, Andre, Ana Digon, Lizzie Sagoo, Irina Herzon
Chain development	Anna Jamieson	Ana Dijon, Simona Moosmann, Jacopo Goracci, Russ Carrington
Certification, labelling, branding	Russ Carrington	Rocio Rosa García, Haseeb Ahmed, Ana Digon, Irina Herzon, Anna Jamieson
Knowledge Exchange Systems	Irina Herzon	Pearse Kelly, Simona Moosmann, Maeve Henchion, Lizzie Sagoo, Ana Digon, Russ Carrington

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EIP-AGRI Focus Group

Sustainable beef production systems

Mini paper: Management of grass based beef production to achieve long term sustainability

Authors: Josselin Andurand, Jacopo Goracci, Sarah Hughes, Didier Stilmant, Vladan Bogdanovic, Ana Digon, Lizzie Sagoo, Iryna Herzon

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1. Introduction

Beef production has been subject to criticism at global level mainly due to its climate and environmental footprint. When managed correctly, however, beef production systems contribute to improving farmland biodiversity, sequestering carbon, sustaining the soil microbiome, managing the landscape, and preventing erosion and forest fires. In addition, they transform resources that are non-edible to humans into human food with a high nutritional value, and play a role in maintaining vital rural areas. Convinced that pasture- and grass-based beef production systems offer many benefits to society, addressing many of the concerns of citizens, and have the potential to provide many ecosystem services and public goods, we develop in this minipaper the levers and innovative practices to enhance the multi performances of these systems. This paper only deals with beef cattle production. Bovine meat productions from dairy or mixed breed herds is not discussed in this paper but could be very efficient systems due to their dual productions.
In a first part we focus on grassland resource management. In a second part we concentrate on the importance of adapting cattle to its ecosystem through breeds and genetic selections. Finally our third part will point out the importance of a holistic approach when assessing sustainability of livestock farming systems.

2. Plant production performance: from soil to pasture

2.1 Grassland management

Per definition, pasture based beef production needs to interconnect grass resources and herbivore needs in order to fulfill farmer objectives in terms of animal performances and, often, also delivery of regulating, supporting and/or cultural services. Depending on these objectives and on the grassland type considered, ranging from temporary to permanent grasslands of low or high ecological value, grassland management is totally diverse, leading to the necessity of gaining skills adapted to each soil-climate conditions, farm structure and farmer objectives.

To face these challenges, different levers and/or innovations may be implemented. The project INNO4GRASS classified them in different domains (https://www.encyclopediapratensis.eu/product-category/inno4grass/): (1) forage mixture including (2) legumes managements, (3) grazing management systems and (4) forage conservation techniques. These innovations are in coherence with (5) farming systems in which they are embedded and the interconnected (6) marketing scheme. The innovations in each of these domains are illustrated by farming systems applying them. For the INNO4GRASS project, money and labour are the most important factors for innovation implementation in grassland farms, both as a barrier to and as a driver for innovation. Legislation is also perceived as a barrier in some countries.

We invite those interested by the challenges connected to the management of permanent grasslands in a profitable way to consult the results delivered by the corresponding EIP-AGRI focus group (https://ec.europa.eu/eip/agriculture/en/focus-groups/profitability-permanent-grassland), which is highly proficient in its contributions.

2.1.1 Sward biodiversity

In order to support low-input farming systems, inputs have to be complemented by ecological functions delivered and/or supported by different plant species. For example, legumes deliver, through their symbiosis with micro-organisms, nitrogen to the system, while providing resources during the summer, when gramineae growth is more limited. Tannin rich species, such as *Leucaena leucocephala*, can help to control the pressure of gastro-intestinal parasites. Species with different rooting schemes allow a better exploitation of soil resources, with the deeper-rooted species, such as *Dactylis glomerata*, being able to face dryer climatic conditions. The combination of species with different growing seasons can enlarge and ensure fodder resource supply and soil cover all through the grazing season. Such plant diversity increase is therefore of interest to

ensure a large panel of ecosystem services delivery: erosion limitation, carbon sequestration, sward productivity, and shade to improve animal welfare when woody species are included.

High natural value, semi-natural or Natura 2000 grasslands have such highly diverse swards that their management is site specific and should take into account farmer's objectives together with territorial objectives (local cooperatives, local policy makers, land planners, tourists, NGO, extension services), local soil and climate conditions, as well as legislative aspects. Several questions relative to this aspect can be highlighted (see the synthesis of the EIP-AGRI focus group on permanent grassland profitability for additional inputs, and EIP-AGRI focus group on High Nature Value farmland https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_fg_hnv_farming_final_report_2016_en.pdf).

How far must we increase plant diversity? More than the number of plant species, this is related to the number of functional groups that must be considered in connection to local conditions: persistence of the species, species adapted to dry or wet conditions, diversity of rooting depth, coexistence in the same environment of herbaceous and shrubby grazing species (biodiverse forage chains).

For these different species, which cultivar should be used? How to integrate, to take into account local species, varieties, ecotypes? In most countries, guidance on complementary and evolutionary plant species and seed mixes are available. However, farmers need to be confident that species recommendations are relevant under their soil/agro-climatic conditions.

How to increase the biodiversity within existing swards through no-till sowing techniques? How to manage weeds and toxic plants in such diverse swards? Which management scheme, in terms of exploitation frequency, intensity, type (grazing, mowing …), fertilization scheme…, to sustain or improve sward biodiversity?

In spring 2018, three upland farms in the South Wales Valleys reseeded 4-5 ha of marginal upland with a multi species ley alongside a conventional ryegrass/white clover ley to compare outputs from the two systems as part of a 3-year EIP project. The project monitors forage production and quality, stock performance and invertebrate populations in the new leys. Welsh landscapes vary significantly in soil quality and fertility, therefore understanding the effectiveness of different sward compositions will allow more efficient, targeted approaches to sowing grass on marginal land. By 2019, as a project average, the increase in dry matter production with multispecies (MS) was only 4%. All sites grew more forage in the spring and autumn on the multispecies leys. Animal performance on the multispecies ley was as good and sometimes better than the control. The farmers reported increasing performance the longer the livestock remained on the multispecies ley – suggesting there may be an 'acclimatization period.' The swards will continue to be monitored in 2020 to assess herbage production and quality as well as animal performance.

Aside from the level of biodiversity found within a grassland, farmers must take advantage of the diversity of the grassland types they have within their farmland. Indeed, due to different soil, topographic and management conditions, grasslands with different levels of precocity, productivity, sward biodiversity, drought persistency…, will take place. The interconnection of these resources in space and time would allow an increase of the grass share in animal diet and of system resilience.

2.1.2 Grazing management

Faced with potential resource variability, both in quantity and quality, accurate grazing management needs to develop specific and locally situated knowledge together with advisors and experts in animals and plants, practicing holistic thinking (van den Pol-van Dasselaar et al., 2020). Indeed, grazing management is knowledge

intensive and doesn't benefit from the one-size-fits-all solutions that can be found for housed, zero-grazing systems. Therefore, whatever the grazing management scheme implemented, there is a huge need to share expertise and to involve front runner farmers as inspiring resources to co-define management practices adapted to local structural constraints (fragmentation of farmland, land accessibility to grazing, herd size increase), soil and climate situations but also socio-economic constraints. Specific operational groups can play a key role in such dynamics.

Ed farms in Kent (UK) has sheep and buys in store cattle. Ed is a member of the Kent Grazing Club discussion group and hosted their recent meeting. The group visited some rented land being grazed with sheep, their lambs and some store cattle. The block consisted of permanent pasture and three recently re-seeded fields. He used dryland mixes for two of the re-seeded fields and they were starting to be dominated by cocksfoot. He uses this block to experiment and he's rotationally grazing the sheep in groups separately. Priority grazing goes to the twin lambs, with the singles and the store cattle being used to maintain quality. The store cattle are also the pressure valve, as if grass growth is declining the store cattle can be removed to reduce demand. The group suggested that Ed needs to focus on nutrient management and evaluate whether additional nutrients would be cost-effective, especially on re-seeds. The main summary points of the meeting were the need to understand how to maintain quality in grass for weaned lambs, to plan for dry times, how to use the cattle as a management tool and when to take action'.

2.1.2.1 A diversity of Grazing schemes for a diversity of ecosystem services delivery

Voisin Rational Grazing (PRV) is based on a division of the grazing area that allows farm animals to graze the grass at a precise moment of its phenology. PRV management is proving to increase the quantity and quality of the pasture, biodiversity and carbon capture (Pereira et al., 2020). Holistic Management or Polyface systems involve rotational grazing, with a different plan for periods of plant growth or plant hibernation. All of these methodologies avoid both overgrazing and undergrazing, as animals do not remain too long in the paddock and do not return too soon, in order to protect plants' resting periods.

Mirko's farm (Italy) grazes cattle on pasture from May till October; in winter the animals are in free housing due to the snow. He has been applying PRV since 2017. In comparison to his previous management scheme, PRV allows: a greater grass productivity leading to an increase of the stocking rate, a decrease of slurry production by 13%, an improvement of animal welfare and health indicators and an increase in floristic biodiversity. It also decreases time and manpower dedicated to feeding, cleaning and slurry-management. Economic benefits have been quantified: the supply and thus the costs of feedstuff, hay-making, silage, agricultural fuel and purchase of straw for litter have all decreased.

Existing literature (such as https://www.researchgate.net/publication/260758305_Applying_the_ecosystem_services_framework_to_pasture-based_livestock_farming_systems_in_Europe) highlights the need to manage, through the grazing scheme employed, some trade-offs existing between ecosystem services delivery.

As an example, continuous grazing with a stocking rate directly adapted to land productivity increases grass dry matter productivity, maintains a short and constant sward surface height with low benefit for pollinators and increases nitrate-leaching risks and nitrous oxide emissions. At the opposite a low stocking rate, under continuous grazing, promotes the development of sward mosaic supporting a higher level of biodiversity, limits nitrate leaching risks and nitrous oxide emissions but increases methane emissions and limits animal performances due to the valorization of grass richer in fibers. If carried out on semi-natural grasslands with

inherently diverse swards and edaphic conditions, this type of management maintains outstanding levels of farmland biodiversity (High Nature Value farming).

An alternative, dynamic rotational grazing, with very short residence time and high instantaneous stocking rate supports higher land productivity (+20% based on research results) but can potentially lead to negative impact on animal biodiversity especially ground breeding birds. Indeed, if resting time is too short, only perennial plants adapted to grazing or plants with vegetative multiplication mode can survive as flowering and seeds production is limited except if some parcels are disengaged from the rotation. Its higher productivity combined with the correct allocation of grass to stock class, results in better performances both per head and per hectare, which means more grass to convert into beef. Rotational grazing also leads to:

- a greater control over grass production which makes grass budgeting and grazing-mowing alternance (all of high importance to support sward perennity), easier.
- a potential grazing period extension through the valorisation (depending on region and soil type) of cropped land resources such as fodder beet, brassica crops or other cover crops, contributing to animal-crop interconnection.

Nevertheless, increased productivity could lead to stocking rate increase and to more frequent problems with overgrazing, soil damage due to animal feet and/or soil erosion under wet conditions, as well as adverse impacts on biodiversity. There is a need to make sure that implemented grazing techniques don't increase the risk of other environmental damage. Dynamic rotational grazing, PRV, Holistic Management or Polyface systems also rely on investment in infrastructure, such as a mixture of permanent and temporary fencing, water supplies, and refuge areas for breeding birds. Finally, labor inputs need to be allocated to different jobs, e.g. measuring grass, training stock to fences or moving fencing rather than generally checking stock.

In France, the Life PTD project tested the effects of dynamic rotational grazing on 255 beef farms. The outcomes show that impact on animal performance depends on the calving period. At the economic level, the most sensitive systems are the suckler to weanling systems. The increase in rotational grazing leads to a decrease in the cost per ha of grass as well as a decrease in the cost of fuel consumption. An improvement on plant biodiversity of grassland was observed as well as positive impacts on GHG emissions (Life PTD, 2020 France https://www.life-ptd.com/).
Nicolas, a farmer in a Limousine suckler to finish systems with 71 cows (France), turns to dynamic rotational grazing in 2017 on his farm. The main results were a decrease in the food cost linked to less food purchased, in particular concentrates consumption, and a lower cost for farming these surfaces.

These examples, that could be part of different grazing practices in connection to a diversity of ecosystem services, underline the need to adapt grazing management strategies to farmers' targets in line with citizens, land managers, policy makers and value chain expectations. However, structural constraints (grassland accessibility, plot size, water access …) highly impact choice and evolution of management practices.

2.1.2.2 Decision support tools developed to improve grazed land management

Faced with this diversity of targets, farmers can employ specific tools to support grazing management, to connect current and/or expected variations in grass availability to animal needs and to the delivery of additional ecosystem services. High tech, 'novel' tools can be interesting, especially for young farmers. They must save labor, change labor type in reducing the 'annoying' work on the farm and produce confidence and control (van den Pol-van Dasselaar et al., 2020).

Some of these tools help estimate dry matter production using grass measurement, with sward stick platemeters, along with farm management software to calculate available forage (i.e. AgriNet,

Grasshopper, Grassman, PastureBaseIreland, PaturNetHerboMETRE and Grip op Gras) or using plant NDVI through remote sensing, coupled or not to modelling approaches, in order to anticipate grass growth based on weather forecasts (i.e. Grass SAT). Other tools aim also to estimate fodder resource quality (portable near infra-red spectrometry devices, remote sensing analysis) while others allow the farmer to adapt resource access to animal needs (virtual fencing techniques, fattening score evaluation) or to adapt fertilizer rate (N application adapted from crop sensors such as Yara N sensor). Now a recent UK Farm Practice Survey reported that only 10% of grassland farms used pasture measurement tools, underlying significant improvement potentialities.

The profitability and competitiveness of new technologies in comparison to current practices must be highlighted in order to allow their larger adoption (van den Pol-van Dasselaar et al., 2020). A barrier for more farmers adopting new technologies is often represented by the poor data connection in remote locations and/or by the lack of 'interoperability' where different technologies fail to link or communicate with each other making the farmer's life harder from a technology perspective.

For an overview of existing tools aiming to improve grassland resource management one can check the following links:

https://www.inno4grass.eu/images/dokumenty/Overall_rankings_grassland_tools.pdf.

https://www.super-g.eu/2020/06/23/report-on-decision-support-tools-published-d5-1/

In Wales (UK) sheep and beef farmer Philip uses a combination of physically measuring field grass dry matter with a plate meter, combined with satellite data, to plan and manage the grazing on his upland farm. The data he collects is entered into a feed and farm management system on his phone (linked remotely to his computer) where he can plan his feeding strategy over the coming weeks and months. Using rotational grazing with a combination of permanent and temporary fencing he is able to move stock around the farm depending on where the feed is available. The management tool allows him to plan well ahead into the season, understanding if he has too much grass, therefore allowing for hay or silage to be made, or not enough, so alternative feed must be purchased or stock sold. His long term ambition is for the satellite data to be able to accurately monitor field dry matter levels to reduce having to manually collect grass data but currently he is not confident enough in the satellite data to be able to rely on it completely.

Decision support tools, based on Drone, GPS, SIG and 3D modelling, can also be of high value to improve the interaction between the diversity of actors (farmers, municipalities, researchers, NGOs, cooperatives, forest agencies…) involved in the management of shared territories such as land of high natural value (e.g. **http://www.hnvlink.eu/download/Greece_3D-mappingtoolsandGPS-trackingsystem.pdf** **http://www.hnvlink.eu/download/TheUK_Commoners_council.pdf**)

In such open territories, the definition of shared and improved ways (fencing cost sharing…) to safeguard grazing animals from large carnivores, or prevent conflicts between beef production and forestry, is a frequent issue.

Grasslands and their management by ruminants, also play key roles in mixed-crop animal farming systems and especially in low input farming systems through soil fertility maintenance, non-edible biomass valorization and cropping system diversification with inclusion of multiannual covers able to control weed development and increase soil organic matter content. Nowadays temporary grasslands, included in crop rotations, are often mowed. Special attention has, therefore, to be paid to limit soil structure deterioration and soil compaction. To do so, farmers can mobilize tools. Examples as VSA (Visual Soil Assessment

https://www.bioagrinomics.com/visual-soil-assessment), Visual Evaluation of Soil Structure (VESS, https://www.sruc.ac.uk/info/120625/visual_evaluation_of_soil_structure) or Healthy Grassland Soils (AHDB, UK, https://ahdb.org.uk/knowledge-library/healthy-grassland-soils), help to assess soil quality in a relatively simple way.

3. Cattle management: adapting animals to ecosystems

3.1 Breeds and genetic selection

It is very well known that European beef production is characterized by extreme diversity in both the production systems and germplasm used. This results in a range of breeding objectives, including a range of traits, such as weight traits, traits related to fertility, calving ease or mothering ability of cow, feed intake and efficiency, carcass and meat quality attributes. Apart from these conventional traits, selection for a broader set of traits, including longevity, welfare, health and fitness traits, is becoming more widespread as beef producers realize that sustainability can only be maintained with a more holistic view of cattle performance. Through large scale recording programs, genetic improvement supported with genetic evaluation programs implementing the animal model have made further genetic improvement possible. In addition, the last decade has seen exponential growth in the development of genomic tests for economically important traits in beef cattle improvement. For beef cattle, a method that uses and combines all types of information, including information on trait recordings, pedigree, and genotypes, is often used.

Another most frequently asked question concerning sustainable beef production systems, especially for pasture-based beef production, is: “What breed(s) of cattle are the best for sustainable pasture-based beef production?” The truth is, no single breed can be identified as the answer to high-quality pasture-based beef. Industrial beef breeding focuses on rapid cattle growth in order to minimize production costs and maximize economic efficiency, aspects that have been subject to criticism due to its environmental footprint. But how useful can this be for pasture-based or any other low-input production system? One solution is raising local or traditional cattle breeds. These are well represented in all regions of Europe, and can attract higher farm revenue through a combination of added-value products and subsidies under traditional breed preservation schemes.

Example of beef breed interest in dairy farms: A dairy farm (Swe,) part of the HNV-Link project, inseminated most of the milking cows with beef breed male semen be able to make use of formerly abandoned semi-natural pastures. Indeed, dairy cattle is not well suited for such type of extensive pastures. These male calves are raised for meat on the farm’s semi-natural grasslands, while milking cows are put on field pastures. This allowed this farm to diversify its production and make use of land that is available to use for free, taking into account that additional agricultural land is in high demand and expensive to rent in this region. https://era-susan.eu/sites/default/files/Suscat tn 213%20final.pdf

FOCUS : 3 local breeds adapted to their ecosystems

The Busha cattle belong to an autochthonous group of cattle throughout the Balkan Peninsula and Southeast Europe. Bushas live on grass and bushes during summertime, but from autumn until springtime they are kept in small stables, fed with small amounts of hay and sometimes corn or wheat. Bushas are long-living, used to be raised on small amounts of feed, are resistant against illnesses and parasites, have high fertility for this type of breeds and are easy in calving. Because of their small weight, Bushas are optimal fo grazing the sensitive grass landscape of mountains.

On the other hand, the Podolian cattle belongs to primeval type of breed and is mainly spread in the northern part of the Balkan Peninsula, including Serbia, Croatia and Hungary. The Podolian cattle shows a great skill to adapt to extreme farming conditions, thanks to its great frugality, resistance to harsh climate, calving ease, great maternal attitude, high resistance to diseases such as tuberculosis, and strong compensatory growth. From the eighteenth century the breed was widespread as a draft animal but nowadays is raised for meat production, though it must be noted the importance of this breed as a tourist attraction.

The Maremmana cattle lives with the Mediterranean maquis, making it one of the few existing cattle breeds that alternate browsing and grazing, that is a diet based on leaves and sprouts of woody species, compared to one based on herbaceous species. Since the last century, two different lines have been selected in the center part of Italy. The "Roman" is characterized by a greater somatic development and larger horns, but also by a lower resistance to the environment and wildlife. In the past, it was used as a draft animal. The "grossetana" line, instead, is a little less muscled, with thinner horns, more rustic and energetic than the other, with a greater dynamic attitude linked to free-range management both in the woods and in meadows (Giuliani, 1928; Lucifero et al, 1977).

TESTIMONY: Jacopo and Maria Novella, Maremmana breeders, Italy.

I believe that a breeder who wants to create a farm linked to the territory must base his/her choice of species and breed on the ecosystem - or ecosystems - present in their farm. In our case, the environment is made up of more than 70% of woods, where the value of wood is decreasing year after year; so we asked ourselves how it would be possible to economically and environmentally increase the value of our territory. Fortunately, the long story of the farm and the presence of a local cattle breed very well adapted to live in forests helped us in our response. So, with the owner, we started again in 1999 from a nucleus of 13 animals, previously abandoned to itself, of old origin Maremmana breed cows, some born in the 80s: dark cows, not too big, very resistant and resilient, with great bones and hooves, from whose daughters we slowly created our "wood-based" breeding. We need independent animals, who know how to look for the best environment for them in the available biodiversity, who know how to graze, how to walk for miles in search of water and pastures, who have a strong maternal attitude. Here, the "Grossetana" Maremmana sturdy breed was a winner for us.

3.2 New technologies for cattle management

3.2.1 Virtual fencing

Virtual fencing systems work by GPS signals that create an invisible ”fence line” containing the animals by sound, vibration and mild electrical stimulation administered through a collar. This system would open up the possibilities of grazing many more areas and offer greater flexibility in the subdivision and management of grazing areas. For example, these virtual fences increase the possibilities of grazing high natural value (HNV) areas without having to erect physical fences in often difficult terrain. In the coming years, with continued extreme weather, virtual fences could allow flexibility to graze completely new areas in time of feed

shortage. Moreover, virtual fences open up new and more cost-effective ways of checking animal health and welfare. Indeed, the system automatically tells the farmer if an animal stops moving and/or behaves in an abnormal way. Finally, virtual fencing systems also open up new and easier ways of reporting animal movement to national animal databases.

At present, virtual fence systems are allowed for goats in Norway. Testing is ongoing to allow its use for beef cattle. Other EU countries are skeptical and/or pending. Presently, the virtual fence systems are rather expensive and there are concerns about the stress that animals could go through, in particular for grazing systems on grasslands where plots are moved frequently, even daily. But it is important to remember that this technique is one of few innovative techniques that could suit smaller farms in remote locations with difficult terrains to manage.

3.2.2 Other new technologies helping cattle management under grazing

GPS collars (i.e. **https://digitanimal.com**/; https://www.adventiel.com/chronopature/) inform about the animal's location on the pasture by sending information to a mobile app. The collars could provide location data and time spent grazing by cattle, as well as body temperature and other parameters including the detection and flagging of anomalies. Some can be used for monitoring herds on difficult terrain (i.e. **www.uth.gr/en).**

However, some farmers express concerns regarding Artificial Intelligence and some advanced digital technologies, such as the cost of purchase, maintenance and updating versus real benefits and ease of use. Moreover, connectivity in rural areas is often limited, and improving it would involve massive deployment of 5G technology, with huge valuable resource consumption and unknown effects on delicate biological systems, such as bees and birds. Technology must not be once again for the benefit of big industry at the cost of leaving farmers behind, disempowering them or not recognizing the value of their practical skills. The connections between grass, animal and human, and the art and joy of managing those relationships and their farms, lose very important components if machinery and computers take over tasks like shepherding or decision-making.

4. Assessing sustainability of grass fed beef systems

4.1 Importance of holistic approaches

Livestock production can have substantial environmental impacts stemming from intensive use of land and water resources, high greenhouse gas emissions and biodiversity loss. Yet, livestock production can also provide additional benefits through its role in nutrient cycling, maintenance of biodiversity and culture of pastoral landscapes. The trade-off between inherently high ecological costs of animal husbandry and its associated benefits thus needs to be handled and communicated. The most common approach to evaluate the environmental sustainability of animal production is through energy use, associated emissions and eutrophication potential in relation to the amount of meat produced (often through life cycle assessment, LCA). This means that, especially if impacts are reported per kg of product instead of agricultural surface used, intensive production systems with high outputs in relation to the inputs are generally found to be more environmentally benign than more extensive ones, even though the latter are often multifunctional. Use of such methods therefore could drive further intensification of animal husbandry at the expense of the multiple benefits. Though this multifunctionality is difficult to capture, there is a plethora of novel methods that aim at providing a holistic assessment. Assessing sustainability of the beef sector should be based on applying such

holistic methods, if the aim is to grasp the multiple values outside of production of meat. Novel holistic assessment frameworks and tools are therefore important innovations in their own right (Annex2).

Those methods must include evaluation of:

- Social aspects through food security (feed/food competition - a critical one for animal production as such), labor conditions and appeal, consumers' health (e.g. exposure to chemicals, antibiotic resistance), consumer-producer connections, family life of producers...
- Environmental impacts such as eutrophication, GHG emission, carbon sequestration, air quality, biodiversity, landscape amenity, water use (especially irrigation), water quality…
- Economics: Production costs, farmer income, dependency towards subsidies…

Example: The Life Beef Carbon project aims to quantify environmental and socio economic indicators on 2000 commercial beef farms in France, Ireland, Italy and Spain. Not surprisingly, the better environmental results were strongly linked with grasslands. More importantly, on those 2000 beef farms from various systems, economic performance was related to carbon footprint and environmental performance. No major trade offs were highlighted (link in Annex 2).

4.2 Environmental impacts of grass based systems

4.2.1 Climate change

GHG emissions are strongly linked to enteric fermentation and the number of animals on the farm. If expressed per kilogram of meat, it is then correlated with productivity. As mentioned before, this indicator must be associated with other environmental indicators in order to have a proper view of the environmental impact of beef systems. Carbon sequestration by grasslands and other agro ecological infrastructures must be taken into account to reflect the real effect on GHG dynamics. On grass fed beef systems, carbon sequestration compensates on average 50% of beef GHG emissions (Life Beef Carbon, 2019).

It is important to note also that current carbon compatibility treats methane as other fossil CO2 emissions. It didn't take into account the specificity of non-cumulative biogenic methane. A mitigation of enteric methane could be a very effective way to limit the warming effect of fossil carbon massive release. The work of Oxford University is really interesting on this aspect https://iopscience.iop.org/article/10.1088/1748-9326/ab6d7e/pdf.

4.2.2 Water

Well managed grasslands can help protect water quality. Indeed, nutrient leaching and soil erosion are generally lower from grasslands compared to arable cropping. However, the risk of water pollution can be increased by over-grazing and soil compaction, which can lead to surface runoff of nutrients and soil. Fertilizer and manure applications should be carefully managed to avoid losses to water: avoid spreading close to water courses and avoid applying during the autumn/winter period. Restricting livestock access to watercourses can help reduce bank erosion and stop livestock defecating in the water, which can negatively affect bathing water

quality. Studies have shown that fencing water courses significantly reduces Faecal indicator organisms (FIOs) input to surface waters (Kay et al., 2018).

4.2.3. Manure management

The spatial separation of crop and livestock production has resulted in nutrient imbalances between regions and monocultures in land use. In some regions, there is an excess of manure from the intensive livestock production that relies partly on imported concentrate feeds, while in other regions, crop farms and regions producing concentrated feeds have to rely on mineral fertilizers. Also, if manure is exclusively used for producing fodder for the ruminants (silage and pasture) and thus remains cycled within animal farms and animal-dominated regions, it has no value to food production for direct human consumption. Mixed farming systems producing both livestock and crop products often have higher nutrient use efficiency (https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/fg16_mixed_farming_final-report_2017_en.pdf).

In some regions, particularly in Northern Europe, cattle are housed for part of the year when climatic conditions are not suitable for grazing. While cattle are housed, livestock excreta is collected as either solid livestock manure (where the animals are bedded on straw or other bedding) or liquid slurry (where no bedding is used). Manure and slurry contain plant nutrients and can be spread back onto the land to contribute to crop nutrient requirements, reducing/replacing the need for manufactured fertiliser.

Efficient use of nutrients supplied by manures is important to maximise the value of the manure and minimise the risk of diffuse pollution of the environment. However, maximising the nutrient use efficiency from manures is challenging because of the variability in nutrient content, costs associated with storage and handling, spreading accuracy, and uncertainty of crop available nutrient supply. Manure management strategies should be based on (i) reliable information of manure nutrient content, (ii) adoption of techniques to minimise nutrient losses to the environment and (iii) integration of manure nutrient supply with inorganic fertiliser inputs.

4.2.4. Biodiversity and landscape

The European Environment Agency (EEA) report of 2019 clearly states that agricultural intensification remains one of the main causes of biodiversity loss and ecosystem degradation in Europe. Feeding ruminants with crops suitable for direct human consumption has been suggested as the most ecologically unjustified practice, leading to a large-scale conversion of native ecosystems, high resource use, and food-feed completion.

Grassland is generally known to have a high potential for supporting above- and below-ground biodiversity. However, intensively managed grasslands, re-seeded as monocrops, highly fertilised, grazed under high levels or frequently cut for fodder, have low biodiversity levels (review Bullock et al., 2020). But beef farms that manage at least a portion of their grassland under low intensity and as semi-natural grassland will tend to have high overall biodiversity. Some pastoral regions are known to support such unique biodiversity that these are called High Nature Value farmlands in Europe. These pastoral regions are estimated to cover up to 30% of the agricultural land across the EU. Their main feature is that herbivores are maintained on grazed or mown semi-natural grasslands. Many certifiers of grass/pasture beef explicitly refer to values of such extensive grasslands or/and the need to manage for wildlife (e.g. grazing refuges). However, certain levels of biodiversity can be maintained also on cultivated grasslands as described above.

We can also mention here the FAO "Globally Important Agricultural Heritage Systems" (GIAHS) project (http://www.fao.org/giahs/en/). GIAHS are outstanding landscapes of aesthetic beauty that combine

agricultural biodiversity, resilient ecosystems and a valuable cultural heritage. Located in specific sites around the world, they sustainably provide multiple goods and services, food and livelihood security for millions of small-scale farmers. In these areas, agriculture and husbandry management have shaped the landscapes with a sustainable anthropization, in which the "beautiful" is combined with the "useful/profitable" and this feeds a local active community. Grass based beef systems are part of European history and identity, and as such could integrate this program particularly for their positive effects on biodiversity and landscapes.

It is a priority to assess and improve biodiversity in beef systems at a large scale, considering it is a key role in order to evaluate the sustainability of the sector. This could lead to a valorization of those ecosystemic services.

Focus : In France the density of hedges, a major agroecological infrastructure for the abundance and richness of ordinary biodiversity, is twice as high on grassland areas than on areas under cultivation (Manneville et al., 2015).

As stated in the recent report of the European Court of auditors (ECA, 2020) maintaining a high level of permanent grassland is very positive for agricultural biodiversity. For the last 40 years, the erosion of biodiversity is strongly linked with the specialization of productions. Large areas of permanent grassland have been tilled to produce cereals. These have been a major factor in the disappearance of hedgerows, ditches and other agro environmental structures (AES). The use of pesticides on these crops has an effect on the loss of biodiversity (especially pollinators), pollution of soils, water and general ecotoxicity.

5. CONCLUSION

Often pointed out in documentaries or in scientific studies, European beef production is not based on feedlots or on very big farms such as in South or North America. European agricultural policies involve maintaining standards regarding animal welfare and environmental impacts.
Grass-based beef production systems address many of the increasing health and environmental concerns of citizens, provide significant ecosystem services and also social benefits, such as maintaining vital rural areas. These systems are highly sensitive to CAP subsidies and to the risks of importss from America, particularly family-owned farms with a limited number of animals and surfaces. These systems play a key role in European territories.
In some extensive areas where beef production is in competition with forestry, maintaining beef production implies maintaining grasslands. Those grasslands are far more relevant to biodiversity conservation than usual forestry practices. Beef production also provides more employment than forestry in those extensive regions and maintains landscapes that attract touristic and entertainment activities. In other areas where crops could be produced, maintaining beef production implies once again maintaining grasslands and high levels of soil organic matter, reducing the use of pesticides and chemical fertilizers. In those regions, grasslands play a very important role on water quality conservation, biodiversity and carbon sequestration as well as on landscape mosaic.
Innovative approaches can help the grass-based beef sector to address current challenges and become more economically, environmentally and socially sustainable.
These approaches should aim to:

- Increase efficiency of grassland and fodder resource production through the evaluation and validation of multispecies sward composition, in order to deliver multiple services adapted to the expectations of farmers and all stakeholders, to local soil and climate conditions and to the implementation of adapted grassland renovation through no-till sowing techniques, ….);
- Optimize the value of these resources through the implementation of adapted grazing and mowing practices, responding to the needs of both farmers and landmanagers (with the help, when available and suitable, of adapted Decision Support Tools);
- Better cover the needs of the cattle, adapting breeds and genetics to their local ecosystems;
- Through holistic approaches, evaluate and give relevance to the positive externalities of grass-based beef production, adapting stocking rates to local ecosystem productivity;
- Connect farmers to each other and particularly to local champions and innovative practitioners, to encourage the sharing of experiences and best practices in the local farming community that others can learn from and get inspired by;
- Bear in mind the importance of farmers being encouraged to take care of family and personal health and wellbeing, physically and mentally
- Highlight synergies and support them through the market chain (see Minipapers 2 and 3 from this Focus Group) or through ecosystem services retribution (such as CAP payments and others)

European beef systems have many strengths but also many weaknesses, and in this minipaper we have seen how there is much room for improvement. The good news is that it is possible to address these downsides and reach long term sustainability.

The key factors named here which enhance farm performance would be improved through dissemination of best practices and innovative approaches, such as in the BovINE project (bovine-eu.net) and others, taking into consideration the regional differences of the territories. Other innovations could address specific problems, such as genetic indexes, beneficial seed mixes for different climates, integration between forestry and cattle, impact of different planned grazing methodologies, options for on-farm slaughter, or developing common indicators regarding pasture, soil and meat product quality improvement.

ANNEXES

1. Projects developing Holistic approaches

The organic movement has been active in developing some of the approaches (see e.g. *Seufert & Ramankutty. 2017. Many shades of gray—The context-dependent performance of organic agriculture. SCIENCE ADVANCES)* that are being modified to the needs of specific production systems, also outside of organic certification. The focus Group identified the following existing ones of relevance to the pasture-based beef systems.

Life Beef Carbon - The LBF project implemented in France, Italy, Ireland and Spain aims to reduce GHG emission from beef production while improving other environmental indicators such as carbon sequestration, biodiversity, water eutrophication, air quality… The first results of the project show a strong relationship between net carbon footprint of beef farms and environmental, technical and economic indicators. There is a strong link between most of the environmental indicators and the percentage of grasslands in general and permanent grasslands in particular. CAP'2ER tool has been used on more than 2000 beef farms during this project.

SUSTAINBEEF – Within the SustainBeef research project, scientists from Belgium, Germany, Ireland, Italy and France are studying how to create a more sustainable beef production system based on the use of grasslands and by-products. The core of the project is based on a modelling approach, using the FarmDyn which is a model simulating44 the choice of the farmer to optimize his profit. Now, the same tool is being used to identify ways of increasing farm sustainability and reducing food-feed competition. By identifying the most relevant scenarios, policy-makers and researchers can examine the scenarios that are most relevant but which require additional support. The model has highlighted innovations that could be of interest to farmers but require more technical validation in experimental farms. These results will help to refine the model and improve the scenarios envisaged. Thus closing the loop.

Pasture4Life - ***https://www.agricology.co.uk/field/blog/pasture-fed-farming-and-public-goods*** Sustainable economic and ecological grazing systems - learning from innovative practitioners' (SEEGSLIP) project has been using a 'Public Goods Tool (PG Tool)' developed by the Organic Research Centre. The project is working specifically with Pasture-Fed Livestock (PFL) farmers in the UK. The current methodology is derived from a participatory workshop with farmers to identify the 'Goods' that they felt needed to be taken into account in a tool like this. The original PG Tool was amended accordingly in order to make sure that it was fit for purpose for PFL farms. The toll is currently being trialed to obtain proper benchmarking of PFL practices.

All of the providers of certification for grass or pasture fed beef (and other animals) have their own criteria of compliance and evaluation toolkits. Examples are: Pasture-Fed Livestock Association (The UK; https://www.pastureforlife.org/), Liivimaa Lihaveis (Estonia; http://grassfedbeef.eu/), De Yerba (Spain), Pasture beef and lamb from Sweden (Naturbeteskött från Sverige), Grassfed AIAG Italian Food Association (http://www.grassfed-aiag.com/), Producer Organisation Organic pasture fed beef (Germany). Outside of the EU, comparable organisations with KE systems are: American Grassfed Association and American Grassfed Research and Education Foundation (USA), Grassfed Meat Association of South Africa.

EIP-AGRI Focus Group

Sustainable beef production systems

Chain development and new business models

Mini paper: How do we bring sustainable meat from pasture to plate?

Authors: Ann Jamieson (coordinator), Ana Digon, Simona Moosmann, Jacopo Goracci, Russ Carrington

funded by European Commission

1. Introduction of the topic

Sustainable grass-based production of beef can be done in many different ways. The basic beef production model is often defined by the areas where the farms are situated, which is one reason why there can be no single definition of the product "sustainable beef". This mini paper will leave the definition aside and focus on market access, which can be a stumbling block for the sustainable grass-based beef-producer. Market access issues in this mini paper are encompassing the entire delivery chain: access and transport to abattoirs, on-farm abattoirs, mobile abattoirs, transport of the meat to markets, cooperation with other farmers and market actors, sales through supermarkets, farm shops, local markets and social media markets. There is also a potentially interesting export market for offal products that could increase the economic viability of sustainable beef production.

Enhancing farm performance, branding and certification issues or communication with consumers are handled in other mini-papers and are therefore left out.

Sustainable food is becoming a concern for a wider part of the public and there is a declared market interest for sustainable products. However, the grass-based beef producers are still often small-scale and/or dispersed over a large geographical area, which creates both logistical problems and difficulties to meet the volume demands of the bigger actors. Not all farms and farmers are suited to, ready for or willing to develop farm gate sales.

Furthermore, if sustainable beef is going to become readily available to a larger community, it needs to enter the more mainstream supply chains.

Likewise, high-end niche products rarely make it into the public procurement sector, both due to price issues and logistic challenges. This mini paper will present some of the challenges and hurdles on the way between farm and fork and also describe some possible solutions to this dilemma.

2. Availability of abattoirs - a limiting factor for local markets.

Partly due to depopulation of many rural areas in Europe, but also the ongoing rationalisation and grouping of slaughter companies, the numbers of local abattoirs have fallen dramatically lately. In Britain, for example, as many as 30 % of the smaller abattoirs closed down over the past 10-year period. Competition from the bigger operators, especially with supermarket chains taking over the big volumes of meat, an increase in the legislation and control burden and an overall increase in operational cost are named as the drivers for this development. For smaller producers, the loss of a local abattoir can be fatal and indeed lead to farmers changing their production systems and abandoning grazing lands. To have access to local abattoirs can help avoid animal welfare threats during live animal transport over long distances. There are many voices for banning long distance transport of animals destined for slaughter, so this issue is very much in the public eye.

Possible solutions to the abattoir problem:

Alternative methods such as killing in the field or on the farm are a possibility. It can help farmers with small herds in remote areas to manage without long, stressful and expensive transport of live animals and underlines the animal welfare aspect. There are two alternatives to conventional slaughterhouses: *Killing in the field and killing on the farm using mobile slaughterhouses:*

KILLING IN THE FIELD works well even in close proximity of the herd. A trained person shoots the animal, it is then bled to death immediately and taken to the slaughterhouse for evisceration. As long as hygiene and safety rules are observed, there are no disadvantages compared to using a conventional slaughterhouse. This is a legal method in some parts of Germany, but then only for livestock that is kept outdoors all year round.

funded by European Commission

KILLING ON THE FARM USING MOBILE SLAUGHTERHOUSES also aims to minimize the stress level of the livestock before slaughtering.
EU law allows both methods, but implementation is very much depending on national law and the will of local authorities. Both methods have been practised for some years in Germany with very positive results. The process is not yet well known and struggles with bureaucracy, some reservation from the public and missing infrastructure for killing in the field, e.g. local enough slaughterhouses for the final processing. In Spain, local legislation allowing and regulating mobile or on-farm slaughter has not yet been developed. Farmers face great difficulty and serious disillusionment when trying to implement either of these practices which have led to bankruptcy and farms being abandoned. In Sweden, killing in the field is not legal for any animal destined for human consumption.

ITALIAN PROJECT WITH SMALL MOBILE SLAUGHTER TRAILER

"Local Action Group F.A.R. Maremma" is an Italian LEADER initiative aimed at economic and cultural development of rural areas. In 2020 they were granted funding for a project about on-farm slaughtering of pigs. The application was submitted by Tenuta di Paganico, an Italian organic silvopastoral farm, in collaboration with agro-alimentary research center CIRAA of Pisa University. The project is focused on developing an unconscious on-farm slaughter technique. It uses a mobile structure with an air conditioning system and a sink for operators. The pig, kept fasting the previous evening, is taken out of the pasture into a barn, using positive reinforcement with food. A trained operator shoots the pig with a free bullet gun. The animal is hoisted with a winch inside the mobile structure where it is jugulated, and the blood is collected in a special tank. The structure is hermetically closed, and the carcass is transported within two hours to the local slaughterhouse for evisceration and all appropriate health checks. The mobile structure, suitably sanitised, can also be used to transport the half-carcasses from the slaughterhouse back to the farm, as there is a refrigeration system inside. Although the project is working with pigs at present, the technique could also be used for cattle. In addition, the project could represent a first step towards a harmonization of laws at national level based on European directives, which is today unfortunately not effective (see links regarding alternative methods of slaughter in Annex)

LARGER MOBILE ABATTOIRS - AN EXAMPLE FROM SWEDEN

The mobile abattoir was presented in late 2014 by the Hälsingestintan slaughter company and the business started slaughtering in early 2015. This mobile slaughter facility for adult cattle was the first in Europe. The facility was completely autonomous, with its own electricity, its own water and its own heating/cooling systems. Separate cooling trucks brought the carcasses back to one centrally placed processing plant for cutting and

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packaging. The company started with a handful of contracted farms and the interest continued to rise among farmers and consumers. The brand was established as "Ethical Meat" due to the low-stress slaughter process on the farm and also the no need for transport of live animals. This seemed to resound well with the consumers. The company also was on the forefront in applying new technologies for increased traceability. The traceability worked as follows:

- The animals are equipped with electronic transponders (RFID technology) in the ears when they are born. The tags have a unique ID-code that can be linked to the animal's birthday, breed, farm, etc. via a database. This provides a secured identity as well as a number of logistical benefits during the animal's growth and handling. For example, it is possible to register weight development and possible medical treatments.
- At the slaughter, each animal ID is reported in the database. The information is then added with slaughter inspection results, such as classification and weight. Whether the live animals are labelled electronically or not, the carcasses are labelled at the slaughter, when the animal's ID information is transferred to a bar code label that accompanies the hanging ring.
- When the animal bodies are to be cut, the barcode is read off. When the details are packed for delivery to store, the information accompanies the label that is pasted on the detail in the form of a QR code.
- On each meat packet, there is direct information about the sex, age, breed, and from which farm it comes. In addition, each tray has its unique QR code that can be read by using a smartphone. When scanning, you get detailed information about the farm and the animal, recipes for cooking and information about Hälsingestintan.

Unfortunately, the economy failed this innovative company, and it went into bankruptcy in May 2019. Economy of scale was never achieved and in spite of having several heavy investors on board, the company lost the equivalent of 10 million Euros over the 5-year period it was active. Some of the problems were that Sweden is a country with huge distances and there are not so many large-scale beef producing farms in the country. The mobile abattoir never worked at full capacity and hence was crippled by big production overheads. The Swedish legislation would not allow animals for slaughter to be gathered at one farm location from several smaller farms, which could have been one solution to the problem. Many of the contracted farmers were badly hit by the bankruptcy and lost lots of money. This has created a lack of faith in new abattoir solutions in the Swedish farming community.

3. Carcass-conformation, weights and classification challenges

Different does not have to mean lower quality. Some farmers who keep their animals on High Nature Value (HNV) pastures and/or with a traditional production method produce carcasses that do not fit into the conventional market streams. The big agrobusiness meat sector generally rewards animal carcasses on the basis of characteristics not linked to a pasture-based farming system. For example: higher carcass weights, the amount and convexity of muscles, lower fat coverage, preferring fat of white colour rather than yellow/orange since the yellow colour is thought to indicate old animals/poor quality meat. This system is at present penalizing farmers with old/indigenous breeds who produce their animals on seasonal herbaceous, shrubby and woody pastures. An alternative classification of such carcasses would help to increase their quality and value on the open market. Today they are often only available to the public through direct farmgate sales.

There are associations, like The Slow Food movement, who especially promotes high quality beef from sustainable production methods. Slow Meat within Slow Food is a project which promotes the following criteria for livestock production:

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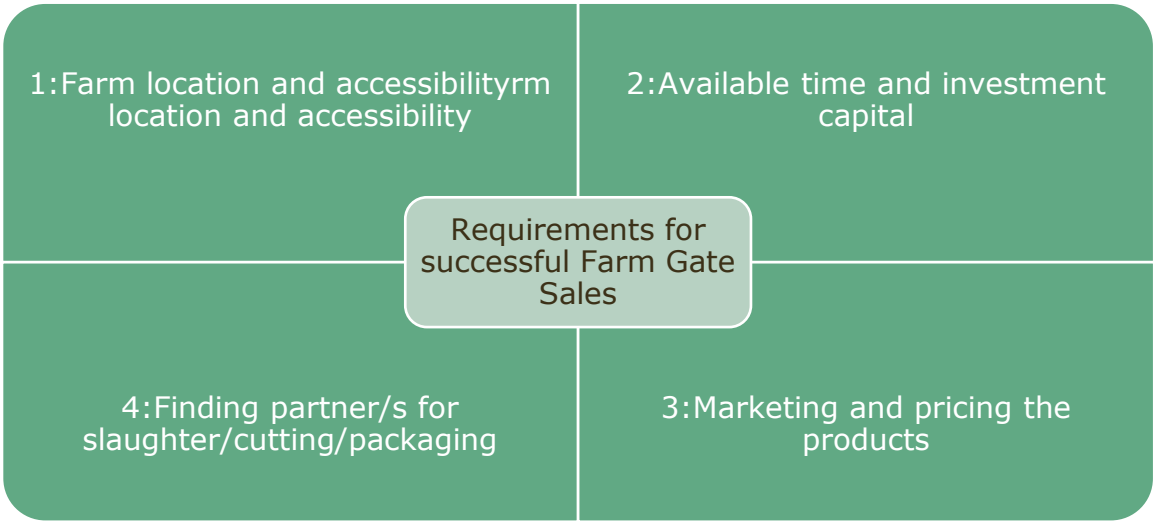
Principles for Slow Food animal production			
Feed	Supplement grazing only with hay	No usage of corn silage	Feed predominantly produced on farm
Health and Welfare	Use of Antibiotic only as treatment of unwell animals	Respect natural growth rhythm and no forcing of reproductive seasons	No mutilation
Management	Prioritize robust local breeds and production methods that preserve biodiversity	No long transports	Animals are kept outdoors whenever possible
Products and filosofy	Processed products are made without synthetic ingredients	Farming is done on a scale that makes a relationship with animals and nature possible	Slow food meat-products are good, clean and fair

4. Bringing sustainable beef products on to local markets

Farm Gate Sales

One way of bringing sustainably produced beef to the local market is through farm gate sales. To sell one's own products directly from the farm is a great way of cutting out the middleman and keeping more of the product value within the farm economy. However, this means a whole new enterprise on the farm with its own requirements:



Things to consider:

1. Reasonable distance to large enough customer base, space for parking, possibility for flexible opening times and/or delivery points, availability of suitable buildings or land for building project.

2. Time for transport of animals and meat to and from the farm, time to contact customers, answering enquiries and manning the farm shop/expediting the orders.

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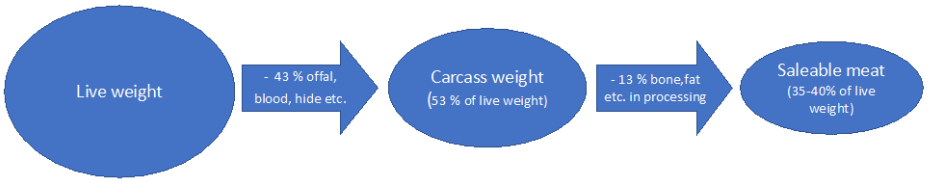
Investment in time and knowledge to reach and maintain necessary hygienic standards, selling pre-packed meat from a cold storage compared to cutting and/or processing your meat has very different requirements, economic robustness for keeping larger quantities of meat in storage instead of selling the animals direct.

3. The farm and animals must be in good order and a presentable state – you are your own trademark, consider the need for a label and/or certification, building trust with your customers making contact between you happy and warm and professional.
Pricing your products right, calculating the production and marketing costs and making a profit.

4. Finding an abattoir interested in selling slaughtering and butchering, using a local abattoir can strengthen your brand, consider and calculate between using a butcher or cutting/packaging on the farm, will you manage to sell all your production from the farm initially or do you need a complementary market strategy?

Pricing the product right when offering it through a direct sale is very important. Both in order to make a profit and to keep the customers happy and returning. All farmers are not be used to having to set their own prices and there are many considerations when doing this. The production cost on the farm is one of the factors, but also calculating the saleable meat percentage and gaging the slaughter, cutting and packing costs. Being part of a group of farmers who cooperate about this can be a help.

Calculating average amounts of saleable meat from live weight



EXAMPLE COSTINGS FOR A BEEF BOX SCHEME (UK)

The Cambrian Mountain Beef group consist of 5 family farms who produce beef on the Cambrian Mountains in Wales. Aided by an EIP Wales project they have been working on setting up a short supply chain for their beef. The project has worked both on knowledge building for the farmers regarding training in butchering, marketing and pricing the beef, but also in finding abattoir and butchery partners for the group. There was some work done looking at the alternative to set up a farmer owned and run processing plant, but it was concluded that, at least initially, there was not enough volume going through the short supply chain to finance this. During the project (2019) the total cost of selling the beef via a box scheme was calculated and compared to selling the animals on the conventional market.

The average price/kg beef in the boxes was calculated by using carcass yield and cut statistics from the abattoir:

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Cuts	**Average weight kg/ 300 kg carcass**	**Retail price EUR/kg**	**Value in EUR** (calc. 1 GBP=1,11 EUR 9/11 2020)
Fillet, Chain and Tail	4,77	38,85	185,3
Sirloin and short rib	33,69	22,2	747,9
Rib on bone and D-cut Rump	25,26	16,65	420,6
Topside, Silverside, knuckle	46,59	11,1	517
Shin/shank, brisket and chuck	13,83	11,1	153,5
Trim	70,71	6,6	466,7
LMC and neck	29,73	6,6	196,2
Total saleable meat (average 75 % saleable yield)	224,58	-	2 687,2

Based on the yield and pricing statistics the following cost/profit analyses was established:

Estimated total cost for rearing, killing (€111), processing (€278) packaging (€ 205)	1 740 €/ 300 kg carcass	5,8 €/ kg
Estimated meat sales (220 kg saleable meat @ € 11/kg)	2 442 € / 300 kg carcass	8,1 €/kg
Difference to cover marketing and selling including profit	701 €	2,3 /€kg
Comparative price for 300 kg carcass (GBR4L) sold to abattoir/market	1 166 €	3,9 €/kg

The full report from this EIP Wales project is available in the annex.

When dealing with locally produced sustainable beef that is directly marketed, transport is an issue that can be solved in various ways. In the UK the estimated cost of using a courier service for delivering the meat is £ 40/box, a high cost that is often debited to the customer. Spanish farmers resort to renting or borrowing refrigerated vehicles, or using refrigerated messenger services for home deliveries, which can go wrong, with very bad long-term consequences for the producer.

Social media supported markets:

A modern way of operating Farm Gate Sales is to do it through social media. Many farmers find that direct sales via online channels and groups are a good way to get premium prices while still remaining accessible to the end buyer. Social media brings about personal connections between farmers and consumers which creates trust between them. This leads to educated and appreciative consumers who enjoy personalized customer service, and quality products at accessible prices.

Farmers find that diversifying (i.e. having various products to sell, both their own and from other local producers) helps online sales, as they can then provide more of a one-stop-shop service. Delivery costs also drop while ease of purchase increases.

In order to do it well, online marketing and direct sales require a considerable amount of time, effort and skills from the farmer. It is yet another task that is almost as important as tending to the animals. The product needs to be well-branded and the customer service done professionally and quickly. Some farmers have help from a

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family member or hire someone for this, which is yet another cost. Many also report that their presence and effort on social networks does not always result in visible increases in sales.

REKO DIRECT SALES

A relatively new supply chain model are the various forms of social media markets for local food and other produce. One example is REKO groups. REKO started in Finland in 2013 inspired by the French AMAP-box delivery system. Each REKO-ring is a Facebook-group where consumers and producers are members. The group decides on regular REKO-delivery dates and in good time before each delivery date the producers present, in the FB-group, what goods there are to order. The consumer places an order and often also prepays the order via SWISH (electronic money transfer). On the delivery date the producer hands over the produce and usually no money has to change hands. The REKO combines many good aspects of traditional local food markets with the avoidance of some of the not so good aspects. The producer can state exactly what he/she has to offer very early in the process. Only the ordered amount of produce needs to be prepared and transported which means there is no waste. When using the prepaid options there are no complications with having to provide small change and no security issues of transporting money. The consumer knows exactly what is available to buy and a relationship is formed between the two parties. The producers often link to their own social media channels in the REKO-group and knowledge of the production model, the farm and the farmers is transferred. REKO now exists in most areas of Finland and Sweden and has also spread to Canada, UK and the USA.

5. Sustainable products on the public procurement market

To reach the public procurement market smaller producers must go together in some kind of cooperation since the public procurement contracts usually demand a fairly large amount of meat. It is also very good if an interested meat company can be added to the cooperation since there is often a rather complicated delivery structure when selling to public customers. One municipality area might have 10 different kitchens that need various amounts of meat delivered on different days. To have the product Quality assured/certified often helps in dealing with public customers since they have to obey the law of public procurement. To remain within these laws, asking for quality assured specific qualities are an important way of justifying an added price tag for sustainable meat. On the other hand, with the increasing interest and political pressure to serve sustainable and preferably local food in schools and other public kitchens, there is often a will to find a way to make a deal that benefits both parties.

PASTURE BEEF AND LAMB FROM ÖSTERGÖTLAND

A cooperation project involving LRF Östergötland (The regional branch of the Swedish National Farmers Union) Östgötamat (Regional Food label and marketing cooperative) and The Swedish Pasture Beef association. The financing comes from the Swedish Board of Agriculture and EU and is in essence a grassland project where beef and lamb farmers are presented as the only sustainable mechanism that can preserve and develop HNV grasslands in the future. The project has made contact with an established local meat-company, Charkman, who had already started selling locally branded pig-meat but mainly to local supermarkets. The project organized several workshops with public procurement officials, farmers and food retailers. After about a year there was enough interest for Charkman to answer several public procurements calls for Quality Assured Pasture Beef and the first servings take place in all the schools in a medium size council, Söderköping in September. The project is at the moment facilitating Charkman by financing a coordinator with the task of contacting and contracting farmers and planning the logistics of balancing sales with buying in the right number of animals. Retail shops and restaurants will be offered meat if and when there is enough coming in. The project is also helping the farmers over the hurdle of quality assurance by offering a free help-desk service and a sizable discount on the initial auditing visit.

REBELLIOUS PARENTS AND CIVIL SERVANTS IN SPAIN

Public spaces such as schools, hospitals, day centres, etc. are great places to serve healthy, local meat. In Spain, catering contracts for these public places are generally issued by the municipality and are often driven by requirements such as finding the lowest possible cost. This has negative consequences on the quality of the food on the menus for our most vulnerable citizens. In some places, however, local residents are teaming up with organic/sustainable farmers and self-organising in a movement to change this. This was achieved in the

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Basque Country, where local schools have managed to enable the parents' associations to be the ones responsible for subcontracting the catering service (instead of the municipality). The parents' association were strongly involved in writing the procurement requirements leading to made "local and sustainable" much more relevant than the cost factor. This group of passionate parents and farmers are now in discussions with other authorities, through the local Rural Development Associations, to also achieve this in the local old people's homes and day centres.

In other places in Spain, progress has been achieved through concerned civil servants working within municipal administrations with the aim to change the procurement laws and requirements.

What becomes evident is that this kind of achievement requires dedicated people and much patience and persistence. The key factor to include is the LOCAL as well as the SUSTAINABLE in the pasture-based aspect.

6. Bringing sustainable beef on to mainstream markets

It is necessary for sustainable beef products to find their way into more mainstream supply chains for the sustainable production models to have more than just a marginal effect on the overall sustainability impact from animal husbandry. It seems that the challenges to overcome, in order to achieve this, are both risk sharing between larger food chains and the producers whilst developing a new product and finding industrial partners who are prepared to work with the initially smaller volumes. The balance between the need for larger volumes in order to interest supermarket chains and the slow pace of developing a sustainable production chain to meet that need is very difficult but it has been done.

SWEDISH PASTURE BEEF:

In Sweden, after 20+ years of various failed local efforts to establish Swedish Pasture Beef on the market, the nationwide Co-op Chain in 2019 decided to make a long-term commitment to bring the product into their stores. They formed a cooperation with the NGO Pasture Beef Sweden and the Quality Assurance company Sigill Kvalitetssystem. Hence there was already a framework and a certification scheme for the product. Co-op signed a contract for Pasture Beef with a large abattoir in Sweden and gave them 4 months to secure enough farmers to be able to initially deliver 15 quality assured carcasses per week. 8 cuts (including beef mince) were marketed and released for the shops to order through the Co-op central delivery system. Pasture Beef has been a success and the numbers of carcasses has doubled in a year with the demand still increasing. However, it is still a very small volume of beef for such a large chain but the long-term commitment from Co-op is proving to be reliable. In this example the abattoir had no role in promoting the production method - the criteria were already set and in parts of Sweden already communicated to the farmers. It was Co-op´s decision to take the risk, of either the products not selling or the abattoir failing to deliver enough quality assured carcasses, that made the difference. From the NGO´s point of view it was a classic case of the raindrop finally eroding the stone, but of course there was also the issue of market trends having changed over the last 20 years.

ORGANIC PASTURE BASED BEEF LABEL BLACK FOREST

In Germany, 95 members of the Black Forest association produce organic and sustainable beef for a local supermarket chain. The farmers mainly manage farmland with high nature value and work with traditional/indigenous breeds. They sometimes struggle to achieve the required slaughter weight on their low productive land. The demand for this beef is rising and many more farmers aim to join in the future. The farmers are not paid as high a price as they could get if selling directly to the customer, but they do have reliable partners with good infrastructure and the producer organisation has a reassuring long history, starting in 1993. Recently a project funded by the German Federal Agency for Agriculture and Food (BLE) supported the association to improve their marketing and producing concept. It has been supervised scientifically by the University of Agriculture in Hohenheim with a whole range of scientific partners involved. When the project is finished the producer organisation can use the results for their further development.

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7. Developing a product together with a large market actor

Working together with a large market actor brings both opportunities and challenges for the producers. For the cooperation to work, large market actors need to accept and work within a different framework than they are used to. Products from sustainable farming do not all look the same, they are often not available all year round, they need different maturing times compared to conventional meat and the production cost is not the same as conventional, more intensively produced, meat. In Spain, an attempt was made by a large organic food chain to contract grass-fed meat. However, they wanted to pay very low rates that were unfair for the farmer and also needed a constant supply for their 30 shops around the country. Large market actors need to understand the intangible value of these products, i.e good for the environment and local rural economies. They can contribute to making them known by using their very effective marketing skills, but they must do so without falling into usual exploitative practices or greenwashing.

NATURBETESKÖTT AND ICA (AHOLD) IN SWEDEN

25 years ago, when WWF Sweden were setting up semi-natural pasture projects in Sweden, they struck up a partnership with the largest national food chain, ICA. ICA was allowed to print the WWF logo on their shopping bags and in return ICA put money into semi-natural pasture projects and also pledged to put Naturbeteskött (beef raised on semi natural pastures) on the shelves. The projects were successful in reclaiming a lot of semi-natural pastures and bringing more animals outside to graze them. After a number of years, a list of farmers involved in these projects were presented to the national slaughter company SCAN and Naturbeteskött came onto the ICA shelves under a generic brand "ICA Naturbeteskött". There was no quality assurance connected to this meat and there was not a very big premium paid to the farmers, in fact it was never more than 10 %. The volumes of Naturbeteskött sold in this way were fairly small and the brand was never seen as a commercial success by ICA. WWF created the Naturbeteskött Quality Assurance scheme together with IP Sigill and tried to push ICA to demand quality assurance in order to safeguard the quality of their Naturbeteskött. ICA took advice from an economist at LRF (Swedish Farmers Union) and decided that this would be too costly for the farmers (and ICA - who then would have had to increase the premium to the farmers) and refused. The long-term effect of this decision was that the volumes stayed low, WWF ended the cooperation with ICA and Naturbeteskött no longer exists as a separate brand in the ICA shops.

Lessons learned from this experience is how important it is to have open communication and to have the same ambition and goal when developing a new product. ICA most likely never saw Naturbeteskött as a viable product in its own right, it was more of a token activity towards WWF in order to keep their cooperation going. A seemingly more balanced and successful cooperation regarding the brand "Coop´s Naturbeteskött" is described under chapter 6 in this paper.

8. Evolving markets for sustainably produced beef

In order to make a difference, both in rural development and in the environmental and climatic impact of beef production, we strive to develop the production of sustainable beef from niche to more mainstream. But in doing so - what challenges and risks lie ahead? Below is a table (created by the organisation Pasture for Life) based on experiences made in the UK. When comparing to experiences from other countries it is clear that the development from left to right does not always happen in the same way. It can, due to various opportunities and/or crisis or climate event such as the draught of 2018, make leaps and skip some steps. On the whole this graphic points to both the strengths and challenges that producers of sustainable beef, and many other commodities, faces. Also, most of the large-scale meat-companies and abattoirs, both globally and around Europe, are running their own sustainability projects. To what extent this will lead to a real shift towards a more sustainable meat production and consumption or not, remains to be seen. The worry of "grass-washing" is real and underlines the importance of some form of a common definition and maybe also labelling and certification.

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	NOW	THE FUTURE…	
Scale	Niche	Emerging	Mainstream
Volumes (average year-round)	< 50 head / week	50 – 400 head / week	400+ head / week
Production base	Disparate (focused around pioneering producers)	Widespread and an accepted production method	Commonplace
Quality	Seasonal, inconsistent	Bands of similar consistency in stretching seasons	Consistent year round
Routes to Market	Online sales (meat boxes), farm shops / pop-up shops	High street butchers, other "high-end" outlets targeting specific customers such as restaurants	Public procurement (schools, hospitals, etc.) and every major retailer
Supply chain mechanics / logistics	Local private kills at small abattoirs, mobile abattoirs (in future) that farmer then sells through short supply chains	Medium abattoirs killing and coordinating on-sale of carcasses to their customers / fulfilling supply contracts	Large / major abattoirs managing (and controlling) a longer supply chain
Price	Good value	Going up	Going down (commoditised)
Supporting communications / marketing	Self-promotion by farmers / farm shops (direct marketing)	Collaboration in supply chain to promote a shared product	Industry level communications to general public (creating real change in consumer mindsets)
Customer profile	Niche, conscious, seeking, specialist diets, health focused, high ethics	Fashion / trend – driven, like to be different, cash availability	All income levels and demographics

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9. The farmer's view on successes, failures and needs along the farm -to-table chain for sustainable beef

Voices from farmers belonging to Agricultura Regenerativa in Spain:

Sustainable beef farmers and consumers, especially young families, are increasingly connecting directly around the concept of local, artisan products that are good for the health of people and the planet. Aged consumers seem to connect because they enjoy tastes that remind them of their childhood.

How are these farmers and consumers getting products onto their tables? Through direct online sales, coops or platforms of like-minded farmers and consumers, farmers' markets, local butchers, consumer groups or CSA, organic shops, organic coops, restaurants (mainly gourmet). Products with "a good story and a family face" behind them are becoming more and more appealing. A clear, simple name, brand, image and poster are of great use.

Hosting farm visits, particularly for families and school, is very useful to educate about their management, their products and their benefits. Children are particularly sensitive to environmental and animal welfare issues and can become game-changers at home.

Some farmers, however, still find that part of their production has to go onto the conventional market, as they are not able to sell it all at a premium to conscious buyers. This is due to a combination of factors, which have a lot to do with "being alone", with little support from public administrations.
Farmers have to build up a strong brand and a visibility they do not have, while struggling against the bad image of red meat in the media and particularly active vegan movements, which is very discouraging and even depressing.
They also find that, after having done huge work to build up the image of a particular product, sometimes mainstream industry comes in and benefits from that image. Often stripping the product itself of the traits that make it different and special, such as connection to local rurality. Examples of this are Iberian pork or Malagueño goat, where after much work by locals, now animals raised abroad are being brought into Spain and sold under these brand names.

The difficulty and tediousness of bureaucracy and paperwork is something all farmers report about in the EU countries. The administrative burden stems from national rules as well as the very complex EU support system regulations. This paperwork often requires hiring someone in order to manage which of course eats into the already strained farm economy.

Innovation needs, knowledge gaps and possible solutions.

- There is a gap between the niche markets and the mainstream beef suppliers when it comes to grass-based sustainable beef. There is also an innovation need identified for quality protection, of the concept of pasture-based beef. Possibly a pan-european production- method classification system like the carcass conformation classification system could be one solution. The risk of green-washing/grass-washing conventional intensively raised beef is growing with the growing interest and market demand for sustainable beef.

- More explicit support from public authorities, with awareness-raising campaigns about "eating less meat but better meat for your health and the environment" would help and strengthen brands that offer local, pasture-fed meat. The present Covid-19 crisis should be taken as an opportunity to encourage these changes at municipal as well as national levels. *Joint efforts on producing science-based information material could be an Operational Group topic.*

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- The decreasing numbers of local abattoirs is a growing problem for the producers of sustainable grass-fed beef. *More research/trials of alternative slaughter methods must be put in action and the legislation regarding on-farm slaughter methods looked into and adapted consequently.*

- The increasing administrative burden on beef producers is something that needs to be addressed as it leads to insecurity, frustration and possible farm closure. The need to speedily report movement of animals between different pastures, the constant changes in the official records of the farm acreage, the demands on recordkeeping of feed-suppliers, veterinary journals and chemical information sheets are only a few examples of this.

- A beef farmer needs at least three years to bring on a beast from time of conception to meat being ready for the market. Sustainable production methods might take even longer. This means that farmers need long term commitment from other partners/actors along the delivery chain in order to feel comfortable in making changes. *How to build and maintain such relationships could be an Operational Group (OG) topic.*

- The widely spread opinion that cattle ("cows") are entirely responsible for the climate crisis is a huge worry for beef-farmers and is beginning to make them depressed. They need help to tell another story - and need to feel that they are being heard and supported by the general public.

- Far reaching cooperation on a local level between producer associations/producers and consumer associations and restaurants/supermarkets, can help improve marketing and knowledge of high-quality beef. It can also be a starting point to develop short local food supply-chains with low carbon emissions.

- A stronger commitment to facilitate the use of sustainably produced beef by the public sector would benefit both producers and consumers. *Knowledge exchange between public procurement staff and sustainable beef producer associations could be an OG-topic.*

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Annex:

Public procurement:

https://ec.europa.eu/info/policies/public-procurement/support-tools-public-buyers_en

Organisations mentioned:

www.naturbete.se

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www.pastureforlife.org

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Fact sheet on protection of animals at slaughter:

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Welsh Mountain Beef project:

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Student report on REKO -rings in Sweden:

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EIP-AGRI Focus Group

Sustainable beef production systems

Mini paper: The role of certification schemes, labelling and branding for aiding the transition to sustainable beef production in Europe

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1. Introduction

This mini-paper has been produced as part of an EIP-Agri Focus Group considering Sustainable Beef Production and co-authored by several experts working in this field.

To incentivise producers, assist supply chains and provide reassurance to consumers, common tools are needed that can provide frameworks for all stakeholders to increase the sustainability of beef production. One such tool is the labelling of products to recognise different methods of production and handling along the entire food chain. This can be in the form of certification marks, logos or brands and take private or public ownership, and may or may not be backed up with a quality assurance scheme.

This paper explores the role of certification, labels and brands, and the rationale behind them, to deliver beef production which is more appropriate for the effective management of the environment, Earth's finite resources, the physiological needs of animals, the preferences of consumers and needs of society. For the purposes of this paper examples researched and explored were generally associated with beef from cattle raised predominantly on diets of grazed or conserved pasture, and ideally with no feeding of grains, soya, maize, food waste or any other feeds considered unnatural for ruminant livestock.

2. What is certification, labelling and branding and how do they interact?

2.1 Certification

Certification**,** or quality assurance, is the assurance and verification products or businesses receive that prove that their production conforms to a specific framework, process or standard.

Compliance for certification can be provided by a third party (e.g. by an accredited certification body, which offers greatest credibility), a second party (e.g. peer assessed, sometimes known as "Participatory Guarantee System"), or first party certification (self-audit). Definitions of certification terms and the international framework for certification are described in Annex 1.

Examples of certification schemes for sustainable beef in Europe (left to right: Pasture for Life (UK), Italian Grass-fed (Italy), Certified Pasture Beef (Sweden), Certified Grass-fed Beef (Estonia))

2.2 Labelling

Food labels can be defined in several ways. In a technical sense, food labels are a legal requirement in the EU and most of the world. They must present concise information about the product, its ingredients, and its origin. The information on them is usually regulated by law. Labels help consumers make informed choices about the food they buy, how to store and use it safely and when it should be consumed by.

On another level, the expression "label" is also used for proof of a production model or by a certification scheme, such as *Organic* or *Certified Angus.* In these cases, however, there is rarely legislation governing what can or cannot be stated in association with such labelling claims. Instead the certification itself governs what the label stands for.

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Thirdly there are Private Labels, which are applied to products manufactured by one company but sold under another company's brand.

2.3 Branding

Branding as a word originates from the practice of identifying one person's cattle from another by burning a mark on their hide. Today, branding relates to some kind of value, which can be perceived or experienced, on a product, a service or even a whole supermarket chain. Branding can be explained also as trust and the feeling of "knowing what you get" from a certain supply chain. Brands can be of enormous economic value and need to be safeguarded and developed by measures of quality management. A logo, packaging, typography, and personality all represent a brand, along with customer service, price, product quality, and corporate responsibility. However, a brand can also be intangible involving emotional, visual, historical, and human qualities.

PURE BEEF
CAPE GRIM
TASMANIA

WHITE OAK
EST. 1866
PASTURES
BLUFFTON, GEORGIA

Examples of brands relating to sustainable beef from Australia and USA.

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2.4 Interaction of certification, labelling and branding

Both labels and brands can be endorsed by certification schemes. The need for certification of a brand can especially arise when "imposters" come on the market trying to take advantage of an existing brand by pretending to offer goods of the same quality, or from a similar but different production system. Equally, a certification scheme or label can popularise itself through its brand (which encapsulates quality, trust and other emotional and visual qualities).

3. Common themes for labels linked to sustainable beef production

There is often asymmetric information present between consumers and producers and it can be hard to differentiate unique production systems and their attributes. Certification schemes and labels do however provide a link between farm and fork to help reduce this information asymmetry. By doing this, labelling becomes an essential tool to increase consumer trust and demand, and can furthermore increase the economic viability of sustainable beef production.

Secondly, labels can reduce the potential for misrepresentation of production attributes. In this way, they help producers and supply chain actors provide meaningful product differentiation.

Most existing labelling schemes linked to sustainable beef are set to encourage a transition towards better standards, plus recognise production that complies with food safety and sustainability standards for better animal welfare, reduced carbon footprint, increased biodiversity, etc. They are becoming increasingly important in today's market as consumer demand for environmentally and socially conscious agriculture is increasing over time. By recognising products with genuine integrity these labels help consumers make purchases that are aligned to their values and aspirations.

In addition to recognising better production, sustainable beef labels are often also preserving local breeds (and their genetic heritage) and management practices, and encouraging cultural activities like agritourism which increase the economic viability and cultural importance of agriculture as well as the resilience of the ecosystems where production is occurring.

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4. Common challenges

4.1 Economics

The first and foremost challenge that agriculture faces today is that of economic viability. This is especially true for sustainable beef labels that provide additional ecosystem services which may incur additional costs for the producer. Whilst most farmers who sell their products under pasture-based labels rely on subsidies and government support to be economically viable, some research is indicating that pasture-based production (with fewer inputs and working more closely with nature) can improve margins once established [1].

While labelling strategies have proved to be useful in increasing production standards and meeting consumer demands, it still remains to be seen if these labels sufficiently compensate the farmers for their sustainable practices and ecosystem services in the form of premiums or other payments.

Organic food labels which have achieved some market share since their inception provide useful insights into how sustainable beef labels can be mainstreamed in the EU.

4.2 Consumer context

A second common challenge in mainstreaming sustainably produced beef is the gap in knowledge between production and consumption. Consumers are often not aware that cattle are fed anything else besides grass and therefore struggle to discern between grain-fed and grass-fed systems for example. This can lead to consumer confusion which is further exacerbated by the recent negative portrayal of red meat in the media. Much like the organic food 'revolution', the hurdles of consumer acceptance and consumer knowledge need to be addressed before sustainable beef systems can be mainstreamed. Additionally, many dynamic socio-economic factors (depopulation, urbanisation, affordability, etc.) can become hurdles or opportunities for many labels and these perspectives need to be considered when designing labelling strategies [2].

4.3 Time and cost to transition

As markets emerge and premiums remain uncertain for sustainable beef, the stakes are high for businesses converting to regenerative grass/pasture-based production. Whilst this can require substantial capital investments, it also requires time for farm level changes such as soil management and livestock genetics to be

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transitioned. This can impact on supply availability, product quality and seasonality of production. Very often consumer trends will change much more quickly, such as in response to a celebrity chef endorsement, a food scare or a global pandemic!

5. Lessons learnt from Successes and Failures

5.1 Lessons from Failures:

- In Finland, a certification scheme for meat from semi-natural pastures was created in collaboration between WWF, Forest research center Tapio, and producer associations in 2012. However, the scheme has not been able to attract enough producers to be viable. The main reason is the small number of fragmented areas of semi-natural grasslands in the country meaning only a few producers have easy access to them. The producers market their meat products as "natural pasture meat" directly to consumers without a third-party certification. Most have an organic certificate, and do not want to have even more verification controls. Finnish consumers lack the understanding of the added value of "natural pasture" as compared to "pasture". No other grass/pasture based schemes or producer groups exist in the country and meanwhile mainstream meat retailers market their products as "focused on grass", which does not necessarily translate into genuine environmental benefits.

- WWF Sweden started working with semi natural pastures and pasture beef as a brand more than 25 years ago. WWF has a policy of only endorsing quality assured products and hence pushed hard for pasture beef to become quality assured. Criteria for how pasture beef should be produced had already been established within the WWF project groups. There was also a logo/attempt of a label that was supposed to be coupled to the certification scheme. A third party certification scheme was created and launched within the main agriculture Quality Assurance Company Svenskt Sigill set of standards. The problem was that there was little, or no, interest in a quality assured product at that time. There was an attempt to certify the ICA (nationwide supermarket chain) own brand Pasture Beef, but those attempts failed due to perceived lack of economic incentive from the farmers. The market was simply not paying enough for the farmers extra work performing the quality assurance paperwork and paying for the certification schemes. The main user of the certification scheme was at that time instead a local producer ring in central Sweden, Naturbeteskött i Närke. This producer ring was run by early enthusiasts and also had an influential ICA shop owner attached to their organisation who wanted sustainable beef in his three shops. The producer ring also sold beef to several council area school kitchens and old people's homes through public procurement and to some top end restaurants in Stockholm City with a special interest in quality beef. The lesson from this experience was that you can't force a certification scheme on to an uninterested market - otherwise it becomes very expensive for the producers.

- In the US, a cooperative of grass-fed beef farmers, Tallgrass prairie coop, found that it could only compete with conventional beef if they were able to produce higher volume (and reduce their cost per unit), which was not possible as they did not have enough capital to increase the volume. Prairie's experience suggests that most companies' profits are generated only at high risk in tiny margins per unit on huge volume, capital-intensive, highly technical operations. Therefore, survival as a niche company in such a competitive climate takes a specialised expert. So, they advise that any such operation should raise the capital to hire a trained, experienced professional.

5.2 Lessons from Successes:

- In the **UK**, the Pasture-Fed Livestock Association has grown from a small group of farmers to a thriving community of over 600 members, many of whom work to the organization's 'Pasture for Life' certification standard and sell their livestock and products to a growing market. A big part of the initiative's success has been in building a community of practice that demonstrates and evidences that production of meat to their 100% grass-fed standard is profitable, good for animals, the environment and human health. Initially

it began with a system of self-audit and later evolved to third party audit as momentum increased and consumer interest grew.

- **Sweden's** nationwide Coop food chain decided to put quality assured Pasture Beef on their shelves in the summer of 2018. A Swedish quality assurance scheme for pasture beef (and lamb) had been established more than 10 years earlier within the Svenskt Sigill Quality assurance standards, but had had little use or spread in the business (see above "Lessons from failure"). Coop took several important decisions that led to the successes visible today;

  - The first was to be crystal clear that they were ONLY interested in certified production. That sent an important message both to the farmers and the abattoir in question.

  - Secondly, Coop understood the slow nature of pasture based production and allowed the abattoir to take time to slowly build a large and reliable enough group of farmers. After approx 6 months of securing the delivery chain enough certified animals could be brought to the abattoir and the products on to the market.

  - Thirdly, Coop reached out to the Pasture Beef Sweden NGO and asked for help with contacts with farmers and with shaping the communication material then used in PR- campaigns and adverts. The NGO also negotiated lower certification fees for the early adopting farmers.

- In **Spain**, Ternera Asturiana PGI agglutinates an increasing number of producers who manage local breeds under extensive systems which greatly rely on common pasturelands in northwest Spain. The customers associate the high quality products to local breeds managed in areas of high environmental value and the PGI helps producers to face the uncertainty and volatility of prices and sales. One of the reasons for this is that under the consolidated seal of Ternera Asturiana, producers will receive a certain guarantee of wide distribution and commercialization of their animals through channels that work with established long-term contracts and prices.

- In the **US**, Wengman's '*Food you feel good about*' label has done well to promote grass-fed beef. Their customers often ask them about the properties of this food, so they train their employees about the production systems [3]. Perhaps such a retail level label could be useful in some EU countries as well. Wengman's buys its meat only from certain farmer cooperatives and provides a direct market link to these farmers. Such a close collaboration between a retailer and farmer coops can provide a good opportunity for farmers to get good prices for their products.

- JBS developed a grass-fed brand by the name of 'Little Joe' in **Australia**. They developed this beef in a way that the marbling score of the meat is comparable to other meats available in the market [4]. This alleviated the concern of consumers regarding the taste or fat content of the product. Furthermore, a key to success to this brand relied on an already existing supply chain network that JBS has in place. Given that this brand was developed using European breeds (such as Aberdeen Angus), it may be worth exploring if such a brand can be built in the EU.

6. Definitions

Whilst many agricultural voices have been suggesting that high-input fast-growth quick-finish beef production is most efficient and therefore more sustainable, there has in recent years been a change in opinion towards lower-input, slower-growth systems being better - particularly when wider issues of land use and fossil fuel use are taken into account. These "better" systems are tending towards being grass/pasture based with animals managed extensively outdoors in tune with nature.

During the development of this mini-paper it has become clear that clarification is needed on what 'sustainable beef' actually constitutes as there are currently several different interpretations across Europe and across

different consumer demographics. For example, certification schemes for grass-fed beef in Sweden and Finland are built on promoting the use of high nature value (HNV) grasslands, i.e. semi-natural pastures, but allow some feeding of grains when animals require supplementation. Whereas in the UK the main grass-fed standard disallows feeding of any grains, but permits all pasture types and has additional requirements for animal welfare. A grass-fed brand in Ireland requires animals to be 95% grass-fed, and parallels exist in the dairy sector where many countries have schemes that relate to the amount of time animals have access to pasture (e.g. 6 hours per day for 120 days per year).

Existing definitions tend to be locally-specific recognising **climatic and cultural differences**, and take an holistic view of many different metrics and influences. In some ways it is therefore easier to find commonalities for what should not be included in sustainable beef production systems (e.g. the feeding of soybeans linked to deforestation).

Furthermore, it is important to recognise that perspectives evolve and change with time, and as new evidence comes to light. As such the definitions for sustainable beef also need to remain **flexible and adaptive into the future** - the most important aspect being that there must be **continuous improvement** (which certification schemes are well placed to facilitate).

A universal definition is nonetheless required to enable fair trade of like for like products across the EU and beyond, transparency for consumers and protection of genuinely sustainable production systems. It is a recommendation of this report to pursue such a definition that can be enshrined in legislation to enable a framework for sustainable beef to become mainstream and prevent consumers becoming disenfranchised by greenwashing, or "grass-washing".

7. The role of marketing alongside labels, brands and certification schemes

Marketing activities are important for connecting products with consumers, usually with the objective of driving sales. There is also an increasing need for livestock/grassland organisations to educate citizens and help them to experience why pasture-based farms and ruminant animals are important.

Many farmers and farmer groups can, with access to appropriate skills and capacity, market their own brands defined by who they are or what they do. Evidence suggests that direct access to and communication with farmers creates a genuine feeling of **credibility, authenticity and trust** for consumers. As such major retailers also heavily feature their suppliers on packaging and in stores.

Without protection or regulation, marketing terms, images or descriptions can also be **misleading**. One example is when the term "grass-fed" is used to describe products from animals that may have still been fed grains or soya, or have been confined, and therefore not meet with the consumer's expectations of the term.

However, consumers are increasingly and more easily able to 'ground-truth' marketing claims. Businesses and organisations that are able to be fully **transparent** about all aspects of their methods and supply chains stand to gain the most by building, and maintaining, trust.

In the case of certification schemes or other national labels, their structures tend to enable greater capacity for marketing and promotional activities that can then underpin meaningful labels. Once trust is won, it can enable growth of sales under the common brand, or identity. It is also shown to be helpful when producers and organisations can work together on marketing and promoting a common standard or definition. Most citizens need to hear a piece of information several times, and often from different sources, before they take action but when they receive conflicting information there is a risk they become confused and lose trust.

In the scope of this focus group there is also a potential conflict between using marketing to grow sales and meet the objectives of certification schemes versus the need to encourage consumers to eat less but better quality products, (that is to shift from just meat to meat as a high value product with other benefits).

8. Consumer trends and preferences

Products from grass and pasture-based farming systems have the potential to meet new consumer expectations and accommodate the ongoing trend towards products with additional value; even beyond organic. To create effective messages tailored to specific consumer groups and products (since different consumers value different attributes in different products), a deep understanding about consumer behaviour and preferences regarding sustainable products is needed.

The EU dietary choices are changing fast, in some cases triggered by the perceptions of so-called "factory farming", and multiple labels/brands are now flourishing to attend the emerging demands. Apart from the increasing number of vegans and vegetarians, there is an important group with "conscientious omnivory," known as meat-reducers, **flexitarians**, etc. who don't consider themselves vegetarian or vegan but show a growing interest in plant-based foods, whilst still consuming meat and other animal products if certain ethical and/or environmental standards are met [5]. This growing group includes an increasing number of Millennials who are key to the future meat market, but who frequently face label confusion when shopping. High quality grass-based products with clean and honest labels, coming from small-scale and transparent production systems following the philosophy of "less but better", and that are easily accessible both in-store or online, could have great potential to meet the demand of these emerging consumer groups. Other consumers who may benefit from healthy grass based products include those with special diets, from infants to the elderly. The potential of labelling and certification to aid access to genuine, specific and healthy products for these sensitive groups is especially relevant.

Other new meat-related products are emerging in response to the growth of new consumer trends, such as **meat-plant blends,** like the ones included in The Blended Burger Project, which base its philosophy on burgers made of meat, but less of it. Other alternatives to conventional meat which are already linked to specific labels/brands include **functional meat products** with modified quantities of components such as fat or sodium, and the addition of certain components such as probiotics or fortification. For these types of products, certification schemes and labels have a great potential to reduce the misrepresentation of production attributes, produce claims and characteristics, while helping the consumer to make more informed choices.

9. The Future of Certification, Labelling and Brands

In this section, the future of certification, labelling and brands for grass/pasture-based beef production in the EU is considered via a SWOT analysis.

Strengths	Weaknesses
• Based on farming systems with attractively lower costs of production • Based on farming systems which are protected against volatility of input costs • Production of labelled sustainable beef is attractive to young and new-entrant farmers • Proven benefits for animals, the environment and humans for products labelled and guaranteed. • Production of sustainable beef is linked to benefits paid for by Rural Development Programmes and hence can improve viability	• There is inherent cost of audit and labelling • Production of sustainable beef is challenging in some areas due to climate, predation, isolation, legislation, etc. and can slow uptake • Participating in labelling schemes does not necessarily remove dependence on subsidies • There are limited resources and services available that assist farmers and supply chain actors transitioning to fully labelled sustainable beef supply chains • Scientific evidence and recognition linked to specific labels is still in development

• Logos, brands and labels provide a communication link between farm standards and consumer expectation • Labels representing cultural or regional traditions can improve economic viability of products, and geographic areas via agri-tourism • Labels and brands are a tool to help protect livestock genetics, including local breeds, suited to specific grazing systems and climates	• Consumer understanding of the nuances of sustainable beef production is low • Not all consumer demographics are interested in environmental credentials of beef or are able to afford premium products
Opportunities	**Threats**
• Many societal demographics have appetite for better welfare, higher quality products meaning labels for sustainable beef can link to better returns for producers • Logos, brands and labels could become even greater tools for communicating the benefits of sustainable beef • Labels could help demonstrate 'less but better' • Labels could link to the evaluation of other benefits delivered by sustainable beef production • Novel technologies could assist with and help reduce costs for auditing, authentication, and traceability • Sustainable beef products could potentially demonstrate benefits over plant-based alternatives to remain competitive • As consumption trends change, new supply chain opportunities emerge for novel products, e.g. the increased demand for local beef during Covid-19 • Graded labelling schemes could incentivise continuous improvement of production standards • New policy mechanisms in the CAP could support sustainable beef production via audited labels	• "Grass-washing" and organisations jumping on the bandwagons with sustainability claims • Misinformation misleading consumers • Some consumer groups reducing beef consumption due to perceived negative environmental impacts • Too many labels with conflicting information are causing confusion and damaging trust • Economic downturns may reduce willingness to pay for better / premium products • Plant-based meat alternatives are able to be competitive on price whilst still generating large margins (used to fund further marketing) • Knowledge for sustainable beef production at a farm level is being lost faster than it is being gained. • Conflicting pressures on land use

10. Policy considerations:

EIP Focus Groups do not aim at providing recommendations to policy makers. However, the experts of this focus group agreed on the importance of policy action and CAP financial support for a sustainable beef sector. The following points are considered of particular importance by the experts:

- Support production systems that deliver multiple societal benefits and perform well on several sustainability criteria.
- Recognise environmental performance of farms in future CAP and channel public money for public goods instead of direct support to all producers, indiscriminately.
- Restore explicit recognition of High Nature Value farmland in CAP

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- Animal production needs more stringent compliance on a number of increasingly important animal welfare and environmental criteria; for example, in several countries, grazing is considered an "animal right".
- Regulatory limits on stocking rates need to be more flexible to allow for local adaptations and cases where carrying capacity is increased through improved grazing management.
- Incentivise public procurement for higher standard production systems.
- Ensure labels representing genuinely sustainable production methods are protected against "grass-washing".

11a. Ideas for new projects and innovations

- There is much to be gained by sharing learnings and mutually supporting the development of certification schemes and labels across different countries. Mechanisms and networks which can facilitate this should be encouraged.
- The market and producers are increasingly ready to embrace sustainable beef production and tool-kits are needed for farmers and organisations to adapt, create their brand or label, and comply with legislation when labelling such products.

11b. Ideas for research projects

- Intensify research into systemic values of keeping animals, including cattle, as part of agricultural production, such as nutrient cycling, grassland as part of crop rotations, mixed production, local/regional food security, local/regional rural viability, biodiversity and landscape amenity; as well as production conditions, under which such values arise. How could these be best utilised in certification, labelling and branding?
- Increase multidisciplinary and transdisciplinary research efforts on sustainable transition of agricultural production and food systems, which include animals and specifically cattle according to the constraints of staying within the planetary boundaries. How could standards of certification, labelling and branding of sustainable beef be adjusted to these constraints?
- Increase development of novel technologies that are relevant to pastoral systems (since currently technological development predominantly focuses on intensive indoor production systems).
- Develop and enhance multi-criteria evaluation tools and approaches, which take into account not only GHG emissions but also benefits of grasslands, animal welfare and other issues. How could these be utilised in certification, labelling and branding in ways that are honest, transparent, and approachable to a diversity of consumer groups?
- Enhance technologies for cheap and certain origin tracing, which will further ease market differentiation for the premium products.
- Develop novel products and food markets for consumer groups with specific needs - elderly, flexitarians etc. - that are possible consumers of premium products.
- Some knowledge about needs and expectations of customers interested in grass-fed products exists in the USA, but in Europe there is a need for more market research and to understand "willingness to pay" (WTP) [6]. Such knowledge could help to better attend to current sociocultural scenarios and emerging diets or customer preferences, and how to use new technologies to respond to their demands.
- Understand the economics for farmers involved in such schemes or labels (e.g. PFLA's 'It Can Be Done' publication)

12. Useful and practical resources for farmers and advisors looking to find out more

NGO´s such as Pasture Beef Sweden help farmers who want to know more about their certification scheme and also help them prepare for the audits. Independent advisors also usually exist who can help advise on conformance to sustainable beef standards, but there are more needed.

National and regional official bodies related to the Agri-food system in Spain promote and/or support the creation of brands for specific products which are produced and/or processed in a particular area. The LEADER Local Action Groups (public-private associations supported under the EU Rural Development Policy (http://www.redruralnacional.es/leader1)) as well as the National Rural Networks existing in each Member State could potentially, inform, guide and help the farmers who may want to promote new products. Non-profit associations can also help farmers with their projects and training, such as the Asociación de Agricultura Regenerativa (**www.agriculturaregenerativa.es**) in Spain, which focuses on pasture-based cattle management. A number of private companies also offer support for administrative and law procedures, training, marketing, etc.

The following table shows some European certification schemes and labels (with their web addresses) relating to sustainable beef production:

Pro Weideland, Germany	https://proweideland.eu/en/
Pasture-Fed Livestock Association, UK	www.pastureforlife.org
Pasture Beef, Sweden	www.naturbete.se
Grassfed AIAG Italian Food Association, Italy	**http://www.grassfed-aiag.com**
NPO LIIVIMAA LIHAVEIS, Estonia	http://liivimaalihaveis.ee/

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Annex 1 - Accreditation and Certification Structures

The International Accreditation Forum (IAF) is at the top of the accreditation and certification framework. It is the world association of Conformity Assessment Accreditation Bodies with the objective to assure that accredited certificates can be relied upon through a single, global programme of conformity assessment.

Accreditation bodies sit underneath the IAF. They are governing authorities that can be either government owned or under agreement with governments. They establish the suitability of certification bodies and are in turn audited by the IAF to ensure consistency. UKAS and SWEDAC are examples of accreditation bodies present in the UK and Sweden, respectively.

Certification bodies are third party organisations who have been accredited by recognised accreditation bodies for their competence to audit and issue certifications, which confirm that businesses along the food supply chain meet the standard requirements.

Certification, or quality assurance, is the assurance and verification businesses receive that prove that their production conforms to the relevant framework/standard. This confirmation is often, but not always, provided by some form of external review, assessment or audit.

Third party certification is the highest degree of quality assurance. It means that the standard owners do not perform the audits themselves. The producers are instead assessed/audited by another, independent company (who are themselves qualified to do so).

Second party certification is when the standard holders themselves collectively assess how well the individual members/producers follow the agreed criteria/standard. This is also known as a "Participatory Guarantee System"[7].

First-party certification is when a producer him/herself, without any auditing, guarantees the adherence to a standard. In practice this is seldom seen as a credible certification.

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EIP-AGRI Focus Group

Sustainable beef production systems

Minipaper : **Knowledge exchange systems for sustainable pasture- and grass-based beef**

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funded by European Commission

1. Introduction

This FG covers beef produced based on agroecological principles; environmentally, economically and socially sustainable; predominantly grass-fed and grazed on pastures whenever allowed by soil and climate conditions. The paper aims to inform the producers and other actors on best practices in organising and running Knowledge Exchange (KE) systems and inspire the transition process to a more sustainable production of beef.

It is likely that, due to the economic value of the beef sector across the EU, grassland and cattle management are concerned by knowledge flows within all national Agricultural Knowledge and Innovation Services (AKIS), designed as the combined organisation and knowledge flows between persons, organisations and institutions who use and produce knowledge for agriculture and interrelated fields. **However, due to its niche character, beef production based entirely or predominantly on grazed grass systems may not be well addressed by the main** AKIS actors in all countries. The extent to which such production benefits from knowledge exchange seems to depend on how easily itfits the predominant production types in a respective country. Specifically: i) how economically profitable grassland management is (significantly high in, for example, Ireland), ii) how much beef comes from suckler beef as opposed to dairy production (for example, minor in Finland), and iii) how easy access to pasture remains with enlarging herd sizes (zero grazing systems have been on increase all across Europe; Pol-van Dasselaar et al. 2020). There is, therefore, concern that with the decline in proportion of cattle that graze, there is also "the loss of grazing skills" (*ibid*) and a diminishing attention to grazing in the existing KE systems.

Only a few existing KE systems specifically target grass-fed production systems. Most targeted advisory is affiliated to public, non-governmental or trade bodies that provide certification for products originating specifically from such systems. There is an increasing number of national, regional and supra-regional initiatives, like EIP operational groups for instance, that address specific issues of animal production, also of beef cattle, on pastureland with explicit objectives to create and sustain efficient KE systems. Finally, many projects, including multi-actor networking projects funded under Horizon2020, specifically aim at co-creating advisory outputs that can be utilised by more permanent KE structures.

Through the analysis of the examples, we draw recommendations on how to enhance KE systems with an ultimate aim of improving the overall performance and viability of pasture based beef systems. Though we focus on beef production, we acknowledge that sustainable production would not have beef as the only system's output. Such system would most likely be based on mixed production on a farm or farm-cluster level, and contribute to a number of public goods beyond producing meat. We also acknowledge that sustainable production of beef should be regarded within the scope of sustainable beef consumption. Many recommendations are applicable to other sectors undergoing transition to more sustainable production systems.

2. Examples from practice

The FG collected numerous examples of diverse KE systems of relevance from across Europe and beyond. Of those, we selected eight to illustrate various types of KE from different countries. The others are in the Annex.

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Name and funding source	**High Nature Value Farming: Learning, Innovation and Knowledge** (HNV-Link), EU Horizon 2020 thematic network
Country, language	Bulgaria, Croatia, Finland, France, Greece, Ireland, Portugal, Romania, Spain, Sweden, UK; English and national languages
Activities	Innovation cases, peer-to-peer exchanges, educational materials
KE type / format	Multi-actor clusters in each area / country, who work f2f on continuous and project-based tasks. Online interaction among the partners
Description	The network to support High Nature Value (HNV) farming systems, many of which are pastoral, by inspiring and sharing innovations/practices that improve socio-economic viability of HNV farming systems while preserving their ecological value and public benefits. All partners are active in various KE. The network received an Erasmus+ grant RUR'UP to improve on higher and vocational education in marginal rural areas (2020-2023).
Reach	Estimated 421,500 people through 500 events during the project
Is it targeted at grass based beef?	No, but most HNV farming systems are grass-fed pastoral, also with cattle. They also make use of semi-natural grasslands as a low-input resource, non-competitive with production on arable land, and with unique biodiversity and heritage values. Multifunctional systems such as agroforestry are common.
Links/references	http://www.hnvlink.eu/about/. Examples of regional KE systems: http://www.hnvlink.eu/download/France_Diagnosisandadviceforfarmers_LifeMilOuvproject.pdf, http://www.hnvlink.eu/innovations/the-burren-ireland/
Advantages/success factors	Though the project ended, the network cooperation continued on issues with identified gaps (e.g., developing education as part of KE)
Limitations	Sustainability of collaboration is not certain

Name and funding source	**AHDB for Beef & Lamb**, levy funded
Country, language	England, English
Activities	Support for beef & lamb farmers in England, including publications, newsletters, webinars, events and market development.
KE type / format	Written information on the internet and emailed/posted to subscribers. Webinars, podcasts, events, focus farms and local KE manager for each region.
Description	Mainly a production and profitability focus for better utilisation of grass/high-quality forage. Links to other relevant publications, podcasts & videos via 'Grass and forage management' webpage. Strategic beef farm programme facilitates more farmer to farmer exchange with a network of farms across the country who host visits/meetings and focus on productivity/profitability of the farm
Reach	Average 500 people attend events per year, 25,000 publication orders per year, 285 registrations per webinar & 500 listeners per podcast
Is it targeted at grass based beef?	No, targeted at all production systems but there is an increasing focus on grass because this is seen as increasingly important
Links/references	https://ahdb.org.uk/beef-lamb
Advantages/success factors	Significant 'reach' of information; It is easily accessible to anyone who wants to access it; Free to access
Limitations	Material is 'passive'; hard to reach all farmers in face to face events

Name and funding source	**Teagasc**, State Grant-in-Aid; fees for research, advisory and training services; income from national and EU competitive research programmes; and revenue from farming activities and commodity levies
Country, language	Republic of Ireland, English

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Activities	The national body in Ireland for providing integrated research, advisory and training services to the agriculture and food industry and rural communities.
KE type / format	The KE service delivered through different mediums: one to one advice, discussion groups, public events and conferences, written articles/factsheets/ booklets, online in web pages, video format, through podcasts and webinars. Also a significant number of joint programmes with industry. A weekly podcast: https://www.teagasc.ie/animals/beef/the-beef-edge-podcast/
Description	Teagasc has approximately 250 professionally trained agricultural advisors who provide a one to one advisory service to farmers. These clients pay an annual fee for this service depending on the size of their farm. They have the option of also joining a discussion group that meets regularly.
Reach	40,000 clients (beef, sheep, dairy, tillage, pigs, horticulture, forestry etc.) through regular contact but also all Irish farmers (app. 110,000).
Is it targeted at grass based beef?	No, grass based beef systems are strongly promoted among beef farmers as they are seen as being the most profitable and environmentally sustainable but there are also other beef systems and farmers are given advice on these also.
Links/references	www.teagasc.ie
Advantages/success factors	Completely independent organisation with a large number of loyal clients: the discussion group format highly successful as a KE tool; Strong linkages between Teagasc Research and Teagasc Advisory - a huge advantage; Young farmer education - a big advantage to Teagasc in KE overall.
Limitations	Hard to reach farmers who are not clients and who do not engage with the public events or published/online material; the one to one service is not free.

Name and funding source	**Mobile advisory teams**, Global Environment Facility (GEF) and United Nations Development Programme (UNDP) for 2007-2011; various grants for continuation
Country, language	Bulgaria; Bulgarian
Activities	Consult farmers on new knowledge and skills for pastoral and other farming practices, about new funding opportunities; preparation of business plans; compliance with the EU standards; marketing activities (direct sales; linking farmers and consumers, organization of joint visits at fairs and exhibitions
KE type / format	Face to face activities led by an NGO (Bulgarian Society for Protection of Birds)
Description	Over 200 farmers were reached in remote areas and 83 applications for agri-environmental funding approved, mostly for grassland based livestock. A farmer's statement: "These people have entered into our daily lives, their contacts are on top of our contact lists".
Reach	200 farmers
Is it targeted at grass based beef?	No, but many farmers reached were beef producers in a High Nature Value farmland region
Links/references	http://www.hnvlink.eu/download/Bulgaria_Mobileadvisoryteams.pdf
Advantages/success factors	It filled the void in advisory for farmers in remote areas at a critical time when the country accessed the EU. Can be replicated.
Limitations	Lack of continuity in exactly this format

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Name and funding source	**Pasture-Fed Livestock Association**, Membership and levy fees, plus project grants and donations
Country, language	UK & Ireland, English
Activities	Online members forum, webinar, newsletters, farm walks, study tours, regional/local discussion groups, certification, marketing and lobbying (government and other sympathetic organisations)
KE type / format	Mainly online interaction but supplemented with face to face
Description	The network of farmers mostly based around the organisation's certification programme (which defines sustainable production) and so the driver for knowledge is assisted by the marketing opportunities, plus a willingness from farmers to find out how they make their businesses more sustainable and effective. The organisation provides the platforms and facilitation for KE. For example, an entirely farmer-led online forum with a daily exchange of knowledge and historic threads available as a library that farmers can easily search
Reach	600 members, with mailing list of 2,000 public supporters
Is it targeted at grass based beef?	Yes, and more specifically 100% grass-fed and grain-free, although many of the members are working towards this rather than actually achieving it before joining. The organisation supports farmers to transition to a 100% grass fed system
Links/references	www.pastureforlife.org Example of virtual farm tour: https://www.youtube.com/watch?reload=9&v=ci0f2Q9oQVE&t=3756s
Advantages/success factors	Flagship for sustainable beef production in the UK, and knowledge is shared in a very positive and collaborative way. New regional approach could enable more growth of the farmer-led model.
Limitations	Quite niche and online forum is currently stretched to capacity

Name and funding source	**GRAPEA** - Groupe de recherche pour une agriculture paysanne, économe et autonome. Financed by French government, private sponsors and members' fees
Country, language	France, French
Activities	Training for farmers, especially in the field, from beginner to advanced levels, to spread technical knowledge with the aim of improving autonomy and independence. Pasture management is a top topic, and specialized groups are formed, e.g. for producers of grass-fed beef. GRAPEA coordinator organizes visits to each farm that include a field walk&talk about technical issues. Finances are openly and jointly analyzed (cost of vets, petrol, hay, salaries, insemination etc). Resources, ideas and advice are shared.
KE type / format	Practical advice exchange in training and coordinated visits to members' farms.
Description	It was set up by farmers to share knowledge, lessen costs and thus improve profitability. They have a small but passionate and effective coordination team who dynamise and facilitate the process and are concerned with the end results.
Reach	Organic farmers in the region of Vendée (NorthWestern France)
Is it targeted at grass based beef?	Not specifically, all types of producers who wish a transition away from conventional intensive systems, but most of them produce beef and milk.
Links/references	http://www.civam.org/index.php/component/myjspace/see/grapea
Advantages/success factors	High assistance of members at courses and meetings, and thus spreading and application of cost-effective techniques such as "paturage tournant dynamique" (managed grazing). Courses are about topics farmers ask for (eg. pasture and grazing management, sowing, milking, natural health for cattle, mobile abattoirs). Huge value to farmers, nurtures relationships and involves generosity and trust.
Limitations	Existing laws and CAP regulations complicate these methodologies and take up lots of farmers' time and training needs.

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Name and funding source	**Landcare organisations** Germany
Country, language	Germany, German
Activities	KE between farmers and nature conservationists, support with funding opportunities.
KE type / format	Advising organisations, NGOs
Description	The board members come from different organisations, interest groups and authorities. Landcare gives advice to farmers about funding opportunities (II Pillar) but also learn from their practical experience; transfer information between farmers and public, authorities, and NGOs. Sustainable beef farmers especially profit from the services: funding and contractual nature conservation offer them a possibility to get paid for the extra services. A lot of them manage difficult High Nature Value on small-scale farms.
Reach	Landcare organisations are represented across Germany, with different numbers of cooperative farmers. The landcare organisation Loerrach, for example, has approximately 360, with rising numbers. https://www.dvl.org/lpv-vor-ort/kartenansicht
Is it targeted at grass based beef?	No, but there are a lot of sustainable beef producer in the programme
Links/references	https://lev.landwirtschaft-bw.de/Lde/Startseite, https://www.lpv.de/, https://www.lpv.de/publikationen/publications.html
Advantages/success factors	Face to face contact; without this support there would be much more abandoned land.
Limitations	Much of advice goes against the mainstream agricultural policy, which supports intensification, also through the 1st pillar payment. This makes messages to producers contradictory.

Name and funding source	**Grass10 Programme**, funded by Teagasc; industry funding and the Department of Agriculture Food and the Marine.
Country, language	Republic of Ireland, English
Activities	A multi-year campaign to increase grass utilisation on Irish livestock farms (dairy, beef and sheep), with the objective of achieving 10 tons of grass DM per hectare per year utilised and 10 grazing's per paddock per year.
KE type / format	A mixture of farm walks, open days, a weekly newsletter, training courses in grassland management, online videos, an annual Grassland Farmer of the Year Competition, articles in the farming press and the promotion of the use of PastureBase Ireland which is a grassland management decision support tool and a database to capture grass data on Irish farms.
Description	The programme provides resources for farmers and Teagasc advisors to improve grassland management skills: organises farm walks and co-ordinate an annual Grassland Farmer of the Year Competition, produces a weekly Grass10 Newsletter with timely and topical advice; organises open days on the winning farms in the annual competition; grassland management courses; Virtual Grass Farm Walks through social media with a high number of videos produced.
Reach	The 40,000 Teagasc clients and participants in Grass10 farm walks and open days. The Irish Farmers Journal - the media partner - is widely read.
Is it targeted at grass based beef?	No, it is targeted at all beef farmers but also dairy and sheep farmers.
Links/references	https://www.teagasc.ie/crops/grassland/grass10/, https://pasturebase.teagasc.ie/

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Advantages/success factors	Diversity of approaches: The Grassland Farmer of the Year Competition in particular has generated a huge amount of interest and has brought forward and into the public eye some successful grassland farmers in all three enterprises
Limitations	A focus on intensive production. It would be useful to also cover issues under less intensive grazing regimes and the increased role for biodiversity on all farms.

3. Success factors for efficient KE

There is a considerable amount of evidence accumulated from research in many fields on what works best in KE systems. It ranges from studies on traditional agricultural advisory and extension to more modern participatory projects (for example, SMART-AKIS, EUROKNOS, 'Changing farm practices: improving knowledge exchange' in Scotland). The key characteristics of the effective KE systems highlighted by FG experts, based on evidence and personal professional experience, are summed-up in eight points.

1. Facilitation process/Interactive innovation approach: instead of a one-way traditional advisory / knowledge transfermodel. Experience demonstrates that learning needs to be facilitated and encouraged. Numerous projects report that producers are commonly disinterested when they were not involved in the set-up of KE process (something that someone else thought would be "a very good idea"). This means that the key actors organising and moderating KE systems should possess facilitation skills as well as personal interest and passion for the process. They often become champions for the transition. Such facilitators should ideally be part of the farmer community, even if not farmers themselves, to engage farmers from the start. Knowledge as such may be of lessor value compared to skills on how to tap into formal or tacit knowledge of the participants. In experience of Pastur4Life in the UK, young farmers have proved very good facilitators - not least because they are prepared to think differently.

2. Inner ring of advisers: though farmers differ in many ways, as a professional group they hold some actors most trust-worthy and influential. The advice from such sources is regarded as trusted and credible. Frequently, these are other farmers with the same or similar systems (sharing the additional values associated with the production) and who manage them successfully in some way (successful pasture management, access to a niche market, proven environmental benefits such as soil carbon or biodiversity). These can also be trusted advisors and local champions – people with vision and ability to connect people around it.

3. Relevance of KE process. The centralised advisory system often poorly serves producers with special needs and/or ambitions. Two example groups are producers who i) want to improve, for example, the environmental or animal welfare performance of their farms beyond the required minimum, and ii) have to cope with harsh environmental conditions, difficult terrain and/or limited access to investments. In some cases, international training can fill in the gaps in availability of the relevant advice nationally or regionally.

4. "Seeing is believing". Engagement and inspiration comes mostly through doing, sharing, discussing, active observation of a transition or innovation on a farm by and with peers. Especially powerful is the presentation of a farm/farmer/ case as a story or learning journey. In words of a farmer, ""It is essential to learn from others who have already started the journey you are going to start. Investigate, get opinions until you find a model that resembles what you're looking for, to know what to do and how to do it" (Co-Farm project). In 'share fairs' or cross-visits farmers come together to present their findings, learnings, reflections and transition journeys, or visit each other. The face-to-face format is increasingly and often successfully being complemented and replaced by online webinars or videos.

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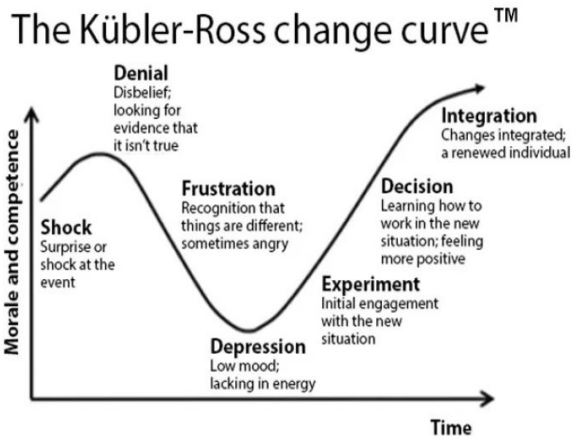
5. Appropriate knowledge at the right time and in the right way.
At different stages of the transition journey farmers require different kinds of support, often presented in different formats and to different levels of detail. For example, in its work with farmers, Pasture4Life project validated the Kubler Ross model of change (Figure 1). Many farmers and other practitioners seem to be going through these stages in their transition journey. Different people may experience all of the stages or skip some of them, for example, denial, especially when coming to an already well-established process. Hope is considered an important thread running through all the change stages, that is, the belief that there will be a positive end to the change. Actors need appropriate support and knowledge at each stage. General seminars and lectures may likely lose both novices and already advanced practitioners, people who are highly motivated and those who go through a frustration stage. KE systems should encourage changes towards even minor improvements instead of promoting the perfect production model.



Source: https://www.ekrfoundation.org/_5-stages-of-grief/change-curve/

6. Overcoming the barriers. The transition to new ways of farming is hard within the rural communities due to the pressures of the family and the community, and poor access to external advisory. While farmers need to be challenged to come out of their comfort zones, there are financial/ reputational/other risks to them doing so. Seeing another farmer having success is very motivating, and being able to talk through how this might be adapted for their farm (through coaching with their advisors/discussion group) is valuable. Learning new skills has a cost, even if only of time and effort. For example in Sweden, reaching farmers with advisory proved to be hard: both free advisory services and pay-for services for "meadow beef" were equally unsuccessful. There is a need to understand why producers are not engaging with services, and how to reduce the costs and increase the perceived benefits.

7. A systemic approach addresses the whole farm or even food system. Farmers often face contradictory advice if it comes from narrow perspectives. Using individual parameters of sustainability can lead to lack of coherence. For example, if the carbon efficiency per unit of output (kilo of meat) is the only indicator of sustainability, then the more intensive the production system is (such as grain-fed beef), the more successful it looks. However, this approach ignores other multiple benefits that arise from less intensive systems or the damage inflicted by intensive production to other sustainability aspects, such as water or biodiversity. A systemic approach often requires changes in the mindset of actors across the whole food chain. Systemic KE systems therefore need to include retailers, consumers, decision-makers. Consumers and retailers have to be prepared to provide feedback to the producers through fair prices, and policy makers through public payments that reflect so-called public goods (benefits to the society at large).

8. The internet has become an important source of information, but browsing it requires a lot of time. Many projects compiled innovation examples and success cases that are easy to navigate in a search engine (e.g. Inno4Grass, HNV-Link). Other KE providers support farmers by collecting/bookmarking relevant web-based content in one place. Social media is increasingly used for peer support and advice, as well as sharing tacit knowledge and experiences connecting various actors. Such tools as WhatsApp groups are becoming successful between specific groups of farmers interested in particular topics, for example, on local supply chains.

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4. Expected future developments & recommendations

The Focus group identified key future developments relevant to producers, society and researchers, which could influence the KE environment. Based on this, the group also made a number of recommendations to support the efficiency and effectiveness of sustainable beef KE systems.

Ongoing and expected future developments affecting producers:

- Higher risks in production due to climate change and water issues
- Increasing regulatory burden (subsidies, regulations, controls) means one person isn't able to know it all, which can lead to frustration and farms being abandoned
- Demographic realities (ageing farmers and lone part-time farmers) stifle innovation
- Fewer younger farmers but increasing interest by lateral entrants, who are motivated and aim to farm full-time; if not inheriting farms, they find difficult starting conditions (cost and availability of good land and infrastructure)
- Abandonment of low-productivity, low subsidised and marginal lands.
- Changes in the means of communication: digitization, new media, easier access to information, easier networking but also more demand for information, sustainability and quality by consumers

Ongoing and expected future developments affecting society:

- Rising expectations on sustainability and animal welfare by society and consumers
- Alienation of rural and urban populations leads to lack of knowledge about farming
- Increased societal recognition of the other ecosystem services provided by grass-based beef production, such as biodiversity, water quality, soil regeneration, etc.
- Nature conservationists are also recognising the role of farmers and their cattle as custodians of cultural and physical landscapes
- Covid 19 has disrupted the supply chains (towards more local and online-based direct sales) and, together with climate change and other crises, may lead to a rising awareness and consumption of regional and seasonal products
- European farming is highly dependent on subsidies, which could become reduced
- Covid 19 has accelerated a communication change: use of new media, easier access to information, better networking over distance

Ongoing and expected future developments affecting researchers:

- Increasing attention to KE in national applied and Horizon2020 research projects (impact is among evaluation criteria); requirements for communication and dissemination plans.
- Effectiveness of KE component of research is often poor: (i) a relatively short period to develop proposals limits the input from other actors, and (ii) the KE lasts only for the project duration.
- Most researchers have no farming background, and many have no formal training in facilitation or delivering effective KE, though many institutions increasingly provide training for the latter skills as part of their curricula.
- Increasing demand to develop efficient transdisciplinary research strategies and tools involve a variety of actors in setting and implementing the research agenda.

Recommendations for farmers:

- Engage in supportive and practical farmer-to-farmer KE networks about best practice, marketing, legislation, paperwork, cooperation.
- Explore possibilities to form an EIP Operational Group (together with other partners such as advisors, business, researchers etc.) focusing on issues relevant to your specific region and context; there are many examples of successful groups, from which you can draw inspiration and search for support in establishing own.

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- Develop local face-to-face relationships and support circles as well as online ones to provide necessary emotional and practical support.
- Give particular value to the input from farmers with traditional knowledge, adapt new visions and methodologies to the local reality.
- Use new media for information, training and innovation; this is particularly relevant for farmers in isolated areas or with special needs who may find it easier to participate in online events, because of the reduced time and cost involved. Online translators can overcome linguistic barriers WhatsApp groups are free to set up and help facilitate discussion between actors.
- Connect with local champions with vision, passion, local knowledge or ability to listen to local knowledge or connect people.
- Develop the farm marketing strategies; consider the potential for direct sales which provide opportunity to showcase product quality and ethical values, and educating consumers about sustainable farming
- Collaborate with researchers to support their understanding of the production system; view this as investment to ensure the value and relevance of future research, and knowledge exchange between researchers and farmers.
- Search for and respond to new evidence provided by research to complement practical experience.

Recommendations for funding institutions and KE providers:

- Focus on dialogue between different stakeholders and support mutual understanding; actively connect with other stakeholders in society.
- Incorporate KE systems targeted to the specific needs of sustainable beef production, addressing the whole system rather than individual issues; examples are diverse public goods from adapted grassland management, high animal welfare standards.
- Provide support with marketing, branding, and communication skills to highlight the quality and added value of multiple beef products.
- Require a minimum level of continuous professional development for advisors.
- Find and support local champions, people who have vision and passion and who are the ones who drive things forward and make them successful or not; reward their engagement.
- Support a younger generation of farmers in the transition to new ways of farming, while recognising the importance of knowledge from the older, more experienced generation.
- Demonstrate good practices and real stories with their successes and failures, to motivate farmers to begin or continue on the transition; use regionally-tailored toolkits/management kits; introduce modules on pasture-based beef production from multiple perspectives in agricultural education and training.
- Translate conclusions of research projects to farmers and the public in understandable and visual ways, such as mindmaps, drawings, flowcharts etc.
- Develop and implement educational modules addressing the pasture- and grass-based systems as parts of curricula in higher and vocational education; search for the available open access materials and possibilities to share teaching across borders (increasingly possible online).
- Focus on training facilitators who can then go out and form their own local groups with events.

Recommendations for researchers:

- Work closely with farmers and advisors to understand the practicalities and challenges of local production systems attending farm events, joining farm discussion groups and through active engagement/discussion on social media.
- Embrace the exchange component of "knowledge exchange" as opposed to "transfer of knowledge" from researchers to farmers and advisors. Researchers need to value the knowledge and experience of farmers, both those who practice ancient wisdom and those who are innovating on their farms.
- Recognise the limits to KE within research projects and try to overcome these limits by (i) linking to existing KE systems/infrastructure rather than creating new ones, and (ii) ensuring KE materials remain available post-project; strive for open access online materials.
- Ensure that research is relevant to farmers and/or society and present the results in clear concise messages. Ask for and take into account feedback.

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5. Annex

5.1 Resources of relevance to KE systems

SCAR AKIS https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/policy_brief_on_the_future_of_advisory_services_scar_akis_06102017.pdf

SRUC https://www.agindustries.org.uk/latest-documents/value-of-advice-project-report/vap-report-2013.pdf (Scotland) 'Changing farm practices: improving knowledge exchange'

'Value of advice' (The UK; https://www.agindustries.org.uk/latest-documents/value-of-advice-project-report/vap-report-2013.pdf)

Results-based-Payments - brochure with examples for pasture-based beef/lamb systems that are rewarded by ecological results in Ireland, produced by Teagasc https://www.teagasc.ie/media/website/environment/biodiversity-countryside/Farming-for-Nature_The-Role-of-Results-based-Payments.pdf

Miller, W.L. and L. Morris. 1999. Fourth Generation R&D: Managing Knowledge, Technology and Innovation. John Wiley & Sons, Inc. New York, NY. 347 pp.

5.2 Examples of KE systems

Irish Grassland Association – an NGO association of industry stakeholders, farmers, advisors and researchers; runs on farm events and conferences, regular publications. Similar associations/societies in Northern Ireland (Ulster Grassland Society) and the UK (British Grassland Society). https://www.irishgrassland.ie/

Farming Connect (Welsh government) - has a part on Grassland Management diverse materials https://businesswales.gov.wales/farmingconnect/livestock/grassland-management

Grass Consultancy Service - a commercial service provider (map paddocks, measure productivity), rotational grazing https://www.grasstecgroup.com/agri-services/agri-services/grassland-consultancy/

Schwarzwald Bio-Weiderind, Germany - a producer organisation for organic beef from the Black Forest https://www.schwarzwald-bio-weiderind.de/18/weiderindfleisch.php?DOC_INST=1

Grass-fed Exchange - a non-profit organization of regenerative ranchers and grass-fed industry supporters https://grassfedexchange.com/about

Agricology (www.agricology.co.uk) - UK network focused on sustainable farming practices, including regenerative agriculture; focus on farmer-to-farmer exchange, but mostly web content.

Groundswell - UK annual farm event focussed on regenerative agriculture (https://groundswellag.com/)

5.3 Projects and networks of relevance to sustainable beef production

SUPER-G Sustainable permanent grassland H2020 project (2018 – 2023) www.super-g.eu

BovINE - thematic network (2018 – 2023) focus on beef production systems, including pastoral and grass-fed. https://www.bovine-eu.net/

INNO4GRASS Shared Innovation Space for Sustainable Productivity of Grasslands in Europe - thematic network, collated a list of Decision Support Tools used by farmers, advisors and policy makers to support any aspect of permanent grassland management within Europe. Decision support tools are designed to help users make more effective decisions and provide one form of KE. https://www.inno4grass.eu/en/

Co-Farm (Erasmus+ project) – focus on education; farm cases for learning about cooperative arrangements, several include grass-fed/pasture cattle. http://learning.cofarm-erasmus.eu/case-category/far2-livestock/

HNV-Link High Nature Value Farming: Learning, Innovation and Knowledge – focus on extensive pastoral systems managed with cattle; innovation cases in a searchable map, education materials. www.hnvlink.eu

Animal Future Steering Animal Production Systems towards a Sustainable Future (EraNet project; 2017 – 2020). https://www.animalfuture.eu

SusCatt project (2017 – 2020) aims to evaluate the productivity, resource-use efficiency and consumers' acceptability of a transition to high forage and pasture diets for European cattle. https://era-susan.eu/content/suscatt

MIL'OUV project, France (2013-2017; LIFE+): Evaluation of biodiverse pastures for their ecological and production values; advisory and training materials, including a pasture evaluation scoring guide. http://www.lifemilouv.org/

"Amazing Grazing" - a pasture-based livestock educational initiative in the US; https://cefs.ncsu.edu/extension-and-outreach/amazing-grazing/

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Annex 4 : Other OG ideas

The remaining OG ideas are summarized in the following tables divided by their main topic.

Figure 3 Summary of remaining Operational Group ideas regarding enhancing farm performance

Title	Description of activity
Trial on carbon sequestration capacity and effects on biodiversity of a rotational grazing system	Trial on a number of farms already using rotational grazing and measure the carbon sequestration of the system. Carrying out biodiversity counts on the farms to see if there is a wider impact**.**
Crossing of dairy cattle and specialized beef breed to reduce the feed-food competition	Terminal crossing of dairy cattle with sexed semen, of specialized beef breeds. The males (bulls or steers) would be more suitable to be fattened in grassland (higher feed intake capacity), under fast rotational grazing scheme, or with rougher fodder resources.
Nature inclusive peatland farming	Using beef cattle (maybe even crossing dairy-beef, even more 'circular') on the peat soil areas for maintaining the beautiful landscape and acquire different benefits. Assessment of ecosystem services Investigation of the possibility of setting up of a market for this special meat
Biodiversity driven farming	Monitoring of biodiversity in the fields and in the soil on an economic driven organic farm Identifying the best steps to increase the biodiversity Creation of a KE group with different stakeholders (water board, landscape organisations, governments, retail) to determine goals for the region/ landscape and fill in the revenue model (less taxes, paying schemes, etc.) Monitoring results & disseminating the lessons learned
Conservation of Dehesas agroforestry systems	Identifying reasons for the disappearance of agro-silvo-pastural systems known as Dehesas, in southern Europe (Iberian peninsula in particular) Identifying examples of good practices to prevent the disappearance Identifying possible solutions

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Figure 4 Summary of remaining Operational Group ideas regarding improving marketing (chain development and new business models, certification, labelling and branding, communication with consumers and society)

Title	Description of activity
Development of a short chain	"How can we make a real short chain product, regional and with higher animal welfare, and thus a more holistic pack of meat?" Establishing regional small slaughterhouses Adaptation of legislation to meet the needs Improving craftmanship by training programs to increase availability Knowledge exchange and planning
Branding Toolkit	Creation of a marketing toolkit for farmers and organisations that are aiming to create their own brand, and for those aiming to create certifications or how to label such products
Smallholder farms communication strategies	Creation of a toolbox for communicating about the benefits of grass fed/ pasture fed beef. Benefits that are evidence based, region specific if possible and common in EU where possible are needed. ▶ starting in different EU countries with definitions and information to be described/ evidence collected ▶ facilitating communication between farmers who are farming (kind of) same sustainable grass fed/ pasture fed way on their needs, overlaps and gaps ▶ preparation of EU and regional communication strategies ▶ creation of country specific sounding board groups (farmers, researchers, experts) ▶ making an online toolbox with audio-visual content, infographics which can be made region specific and target group specific, ▶ evaluating and updating regularly

Figure 5 Summary of remaining Operational Group ideas regarding knowledge exchange and network creation

Title	Description of activity
Knowledge exchange, network creation and capacity building	Identifying examples of good practices regarding: ▶ facilitation tools and profiles of people/training best suited to accompany these conversations ▶ agreement of shared effective and appropriate governance tools and instruments (eg. group structures/organigrams; decision-making levels and processes; assignment, follow-through and monitoring of responsibilities and tasks) Identifying ways to create awareness and disseminate tools and services to help these conversations and agreements along, to be durable and sustainable, as well as flexible, reasonable, democratic, clear and effective.
Better use of common grazing lands	Locating and characterizing of the common lands Discussing the possibility of building a common framework at EU level to clarify their role in providing ecosystem services

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	Demonstrating the most adequate combination of land uses taking into account the conflicts between local communities and other stakeholders Finding alternative ways to harmonize a network of stakeholders involved in the management of the natural resources
Stimulate the entry of new farmers by providing local infrastructure	Supporting local municipalities in regions with a long history of small farms in difficult terrains Identifying possibilities for new entrants, Leading discussions with the retiring farmers and the local public, Bringing together the needed land and infrastructure and helping to find new entrants to farming, Helping with the legal conditions and contracts and creating network to local authorities
Knowledge exchange and network creation on agro-silvo-pastoral systems and valorising the products	KE group on sustainable forest management which can enhance a wide range of different products (firewood, lumber, cork, coal, foraging plants, livestock, outdoor sports, "landscape" as tourism, naturalistic activities, photos, etc.) all closely related to sustainable landscape management, creating "resilient territories" with strong and coordinated local economies based on agro-silvo-pastoral systems. Establishment of demonstration/productive areas for "good, clean and fair" food and for educational purposes on various topics, from technical (breeding, grassland management, forest valorisation, etc.) to tourism and recreation (arts, traditions, etc.) purposes.
Knowledge exchange and network creation on maintaining grazing	How can grazing be integrated into modern knowledge- and technology-intensive farming? What are the appropriate management tools, socio-economic support instruments (incl. subsidies, market premium) and knowledge exchange channels to support this? How can these be translated for use in practice? Investigating, co-developing and disseminating solutions to maintain grazing as part of future farming.
Knowledge Exchange between farmers on local management conditions	Co-defining management schemes adapted to local structural constraints and pedo-climatic conditions as well as socio-economic constraints

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Annex 5 : Relevant research projects

Acronym	Title	Period	An. spp.
	ANIMAL PRODUCTION		
	BOVINE - Beef Innovation Network Europe - **www.bovine-eu.net**	01/2020 - 12/2022	
	SmartCow - Integrated infrastructure for increased research capability and innovation in the European cattle sector - **https://www.smartcow.eu/**	02/2018 - 01/2022	
	European Research Area NETwork on Sustainable Animal Production Systems (ERA-NET SUSAN 03/2016-02/2021) **https://era-susan.eu/content/cattle**		
	FREEWALK - Develop economic sound free walk farming systems elevating animal welfare, health and manure quality, while being appreciated by society **https://www.freewalk.eu/en/freewalk.htm**	06/2017 – 05/2020	
	ReDiverse - Biodiversity within and between European Red dairy breeds – conservation through utilization **https://era-susan.eu/content/rediverse**	09/2017 – 08/2020	
	SusCatt - Increasing productivity, resource efficiency and product quality to increase the economic competitiveness of forage and grazing based cattle production systems **www.nibio.no/en/projects/suscatt?locationfilter=truetp**	09/2017 – 08/2020	
	SUSTAINBEEF - Co-definition and evaluation of SUSTAINable BEEF farming systems based on resources nonedible by humans **https://www6.inrae.fr/sustainbeef**	09/2017 – 08/2020	
	CCCFarming - Climate Care Cattle Farming Systems **https://cccfarming.eu/**	01/2020 – 12/2023	
	FarmSustainaBl - Enabling Smart Livestock Farming Technologies for Environ. Sustainability using Blockchain **https://era-susan.eu/content/farmsustainabl**	10/2019 – 09/2022	
	GrASTech - Precision Livestock Farming (PLF) Technologies to Reduce Greenhouse Gas (GHG) Emissions Intensity of Pasture-based Cattle Systems **https://era-susan.eu/content/grastech**	01/2020 – 12 /2022	
	M4Models - Manure management for methane mitigation - Improved inventory modelling to support policy actions **https://era-susan.eu/content/m4models**	12/2019 – 11/2022	
	MELS - Mitigating greenhouse gas emissions from livestock systems **https://era-susan.eu/content/mels**	01/2020 – 12/2022	
	SEASOLUTIONS - Seaweeds and seaweed-ingredients to reduce enteric methane emissions from pasture-based sheep, cattle and dairy cows **https://era-susan.eu/content/seasolutions**	01/2020 – 01/2023	
	Life Beef Carbon - Demonstration actions to mitigate the carbon footprint of beef production in France, Ireland, Italy and Spain **-** **http://idele.fr/index.php?id=2487**	01/2016 – 12/2020	
	Animal Future - Steering Animal Production Systems towards a Sustainable Future **-** **https://www.animalfuture.eu**	06/2017 – 05/2020	

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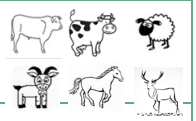
GRASSLAND SYSTEMS			
SUPER-G	**SUPER-G** - Developing SUstainable PERmanent Grassland systems and policies - **https://www.super-g.eu/**	06/2018 - 05/2023	
Inno4Grass	**Inno4Grass -** Shared Innovation Space for Sustainable Productivity of Grasslands in Europe - **https://www.inno4grass.eu/en/**	01/2017 - 12/2019	
HNV Link	**HNVLink -** High Nature Value Farming: Learning, Innovation and Knowledge - **http://hnvlink.eu/**	04/2016 - 03/2019	
LIFE+ MIL'OUV MILIEUX OUVERTS	**LIFE+ MIL'OUV –** Life Milieux Ouverts - **www.lifemilouv.org**	09/2013- 12/2016	
Herby Le pâturage en mouvement !	**Herby Life PTD–** Le pâturage en mouvement - **https://www.life-ptd.com/**	06/2014 – 03/2020	
GENETIC RESOURCES AND BREEDING			
BovReg Understanding cattle genomes	**BovReg -** Identification of functionally active genomic features relevant to phenotypic diversity and plasticity in cattle - **https://www.bovreg.eu/**	09/2019 - 08/2023	
GENTORE	**GenTORE -** Genomic management Tools to Optimise Resilience and Efficiency - **https://www.gentore.eu/**	06/2017 – 05/2022	
FAANG	**FAANG-Europe -** Functional Annotation of Animal Genomes – European Network (COST Action) - **http://faang-europe.org/**	04/2016 - 04/2020	
IMAGE	**IMAGE -** Innovative Management of Animal Genetic Resources - **http://www.imageh2020.eu/**	03/2016 - 02/2020	
FEED MITIGATION STRATEGIES			
microbiome support	**Microbiome Support -** Coordinated microbiome R&I activities in the food system to support EU / international bioeconomy goals - **https://www.microbiomesupport.eu/about/**	11/2018 - 10/2020	
FACCE ERA-GAS	**FACCE ERA-GAS -** ERA-NET for Monitoring and Mitigation of Greenhouse Gases from Agri- and Silvi-Culture - **https://eragas.eu/en/eragas.htm**	05/2016 - 04/2021	
	MARK-EFFICIENCY - Digestive and nutritional indicators of feed efficiency in cattle fed forage-based diets (MSCA) - **https://cordis.europa.eu/project/id/658126**	09/2015 - 08/2017	
ANIMAL HEALTH			
ROADMAP	**ROADMAP -** Rethinking Of Antimicrobial Decision-systems in the Management of Animal Production - **https://www.roadmap-h2020.eu/**	06/2019 - 05/2023	
disarm	**DISARM -** Disseminating Innovative Solutions for Antibiotic Resistance Management - **https://disarmproject.eu/**	01/2019 - 12/2021	

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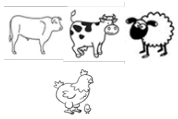
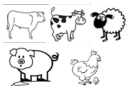
ORGANIC FARMING			
CORE organic	**Coordination of European Transnational Research in Organic Food and Farming Systems Cofund** (ERA-NET COFUND 12/2016-05/2022) **https://projects.au.dk/coreorganiccofund**		
	MIX-ENABLE - Strategies for sustainable and robust organic mixed livestock farming **https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/mix-enable/**	01/2020 – 12/2022	
	GrazyDaisy - Innovative and sustainable grazing-based systems integrating cows and young stock **https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/grazydaisy/**		
PROYOUNGSTOCK	**ProYoungStock** - Promoting young stock and cow health and welfare by natural feeding systems **https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/proyoungstock/**	2018 -2021	
ORGANIC PLUS	**Organic Plus -** Pathways to phase-out contentious inputs from organic agriculture in Europe **- https://organic-plus.net/**	05/2018 - 04/2022	
	PG Tool - OCIS public goods project **- https://www.organicresearchcentre.com/our-research/research-project-library/public-goods-tool/**	07/2010 – 03/2011	
DECISION SUPPORT TOOLS			
FAIRshare	**FAIRshare –** Digital tools for farm advisors - **www.h2020fairshare.eu**	2018-2023	
BIODIVERSITY			
	GIAHS - Globally Important Agricultural Heritage Systems - **http://www.fao.org/giahs/en/**	2002 – cont.	

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eip-agri
AGRICULTURE & INNOVATION

The European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI) is one of five EIPs launched by the European Commission in a bid to promote rapid modernisation by stepping up innovation efforts.

The **EIP-AGRI** aims to catalyse the innovation process in the **agricultural and forestry sectors** by bringing **research and practice closer together** – in research and innovation projects as well as *through* the EIP-AGRI network.

EIPs aim to streamline, simplify and better coordinate existing instruments and initiatives and complement them with actions where necessary. Two specific funding sources are particularly important for the EIP-AGRI:

- ✓ the EU Research and Innovation framework, Horizon 2020,
- ✓ the EU Rural Development Policy.

An EIP AGRI Focus Group* is one of several different building blocks of the EIP-AGRI network, which is funded under the EU Rural Development policy. Working on a narrowly defined issue, Focus Groups temporarily bring together around 20 experts (such as farmers, advisers, researchers, up- and downstream businesses and NGOs) to map and develop solutions within their field.

The concrete objectives of a Focus Group are:

- ✓ to take stock of the state of art of practice and research in its field, listing problems and opportunities;
- ✓ to identify needs from practice and propose directions for further research;
- ✓ to propose priorities for innovative actions by suggesting potential projects for Operational Groups working under Rural Development or other project formats to test solutions and opportunities, including ways to disseminate the practical knowledge gathered.

Results are normally published in a report within 12-18 months of the launch of a given Focus Group.

Experts are selected based on an open call for interest. Each expert is appointed based on his or her personal knowledge and experience in the particular field and therefore does not represent an organisation or a Member State.

*More details on EIP-AGRI Focus Group aims and process are given in its charter on:

http://ec.europa.eu/agriculture/eip/focus-groups/charter_en.pdf

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Join the EIP-AGRI network & register via www.eip-agri.eu

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