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EIP-AGRI Focus Group

Sustainable beef production systems

STARTING PAPER

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Abbreviations

ERBS	European Roundtable for Beef Sustainability
EU	European Union
EU-15	Member States of the EU before 1 May 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, UK
EU-N	Northern MS of the EU defined as those MS which are not part of the group of EU-S [1]
EU-N13	Member States of the EU which joined after 1 May 2004: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia
EU-S	Southern MS of the EU defined as those MS which are at least partly located south of 46th degree of latitude and directly border the Mediterranean Sea, Black Sea or Atlantic Ocean. These are the following eleven MS: Bulgaria, Croatia, Cyprus, Greece, Spain, France, Italy, Malta, Portugal, Romania and Slovenia [1]
SAI	Sustainable Agriculture Initiative
STEM	Science, Technology, Engineering and Maths
UK	United Kingdom

1 Introduction

The beef sector plays an important role in European livestock production. It provides many different services that we all as a society benefit from, in addition to its nutritional and economical significance. However, there has been an ongoing debate worldwide on how to feed the growing world population, and meeting the increasing demand for meat without overlooking the societal concerns about its environmental footprint, its impact on global warming, animal health and welfare, and human health. As a result, transforming the current business models into more sustainable ones is essential, not only for the future of the beef sector but also for the environment and society in general.

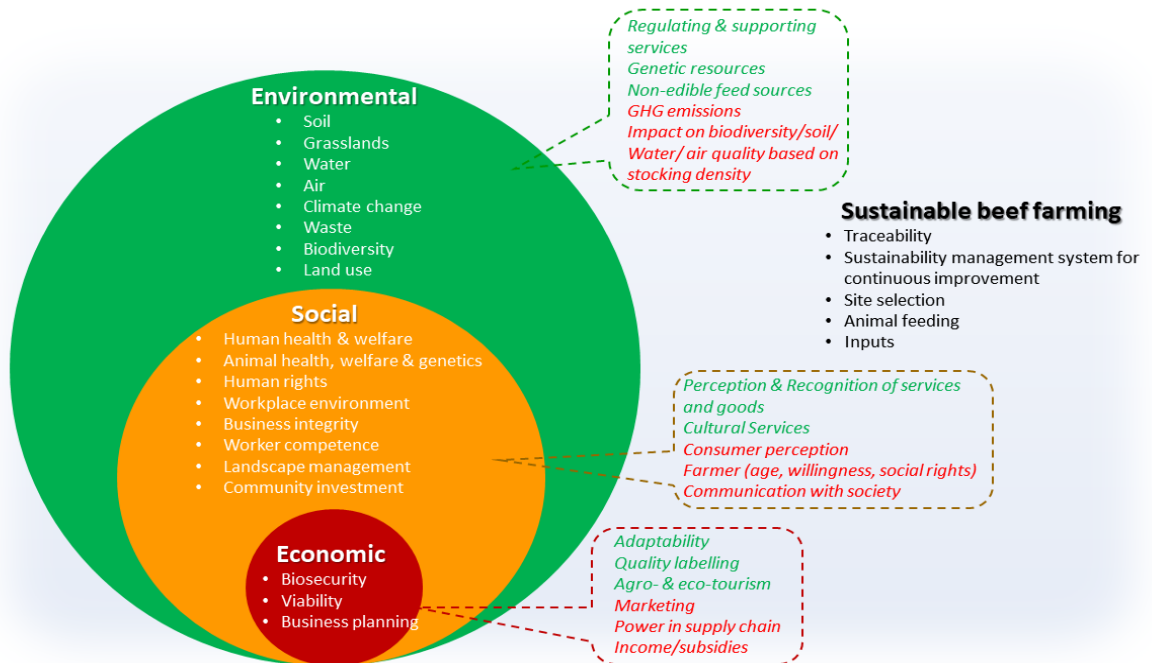


Figure 1 Beef sustainability principles with key challenges (red) and opportunities (green)
 Adopted from [2], based on [1, 3, 4]

Sustainable beef production is defined as "efficient production of safe, high-quality beef, in a way that protects and improves the natural environment, the social and economic conditions of farmers, their employees and local communities, and safeguards the health and welfare of beef cattle." by the SAI Platform Beef Working Group (ERBS)¹. In order to achieve this, ERBS has identified a set of principles which are grouped under economic, social and environmental sustainability as provided in Figure 1. This approach of realizing that the society is nestled inside environment, and economy is a subsystem of the total, illustrates that in fact both society and economy are dependent on the environment since the resources are not limitless for beef production (the green economics paradigm) [2].

It is argued that grass-based beef systems are more sustainable in terms of ecosystem services and public goods they provide compared to intensive systems. The multifunctionality of beef production provides humans with many material and non-material benefits. However, these services or benefits are often neither recognised nor valued sufficiently. Therefore, it is important to present an overview of these benefits and innovative approaches that could increase the ecosystem services and public goods obtained from grass-based beef systems while on the other hand strengthening the valorisation of these services through better communication strategies and tools.

The Focus Group on Sustainable beef production is a temporary group of 20 selected European beef sector experts brought together by the EIP-AGRI to share knowledge and experience. The main question for this Focus

¹ SAI Platform Beef Working Group has evolved into the European Roundtable for Beef Sustainability in 2018 which is a multi-stakeholder platform focussed on beef sustainability across the European region and across all aspects of the value chain, from farm to fork.

Group is “**How can grass-based beef production systems, based on agroecology principles, remain sustainable?**”.

The Focus Group should consider **innovative approaches** that could provide benefits to the different aspects of sustainable beef production: **environmental, social and economic**. Therefore, the purpose of this starting paper is to set the scene on the ecosystem services and public goods provided by the grass-based beef systems and provide a preliminary view on relevant innovative approaches. The starting paper also identifies the key issues and questions and provides a base for the discussions during the first Focus Group meeting. The work to be carried out by the Focus Group comprises of 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.

2 Ecosystem services and public goods

European consumers are interested in the origin of the beef they consume and are concerned about how it is produced. The nutritional quality, as well as good farming practices and grass-based systems, respect for animal welfare and food safety are the topics which are increasingly important to consumers. The impact and contribution of the beef sector on the environment are also being questioned more and more.

Livestock and in particular grass-based systems are an essential part of many agroecosystems, and they play a crucial role in the services ecosystems offer such as maintenance of soil fertility and biodiversity. In addition, they also contribute to public goods, including employment and cultural heritage. Different species and breeds which are adapted to different environmental conditions and production systems transform non-edible resources to edible food for humans and interact directly with ecosystems in particular while grazing. [5]

Ecosystem services are the overall benefits that human beings obtain from ecosystems. The concept of ecosystem services is therefore based on the links and relations between the ecosystems and human well-being as defined in Millennium Ecosystem Assessment (2005).

Ecosystem services provide us with the direct resources to meet our nutritional needs for high quality animal proteins such as meat and milk which are recognised by the society as well as the indirect resources such as biodiversity or carbon sequestration that are not as much evident. Some of these services have economic values that are visible while on the other hand, it is challenging to attribute an economic value to most of them. Regardless of their recognition and acceptance, humans depend on most of these ecosystem services [5].

The ecosystem services and public goods consist of *provisioning services* which cover the products that humans obtain directly from the ecosystems such as food, genetic resources and energy outputs; and the *non-provisioning services* which include the public goods that are available and contribute to the human well-being indirectly. Non-provisioning services consist of *regulating services* which are the benefits obtained from the regulation of ecosystem processes such as climate regulation, flood prevention and disease regulation; *cultural services* that are the nonmaterial benefits humans obtain that provide cultural diversity, traditional knowledge systems and recreational benefits; and *supporting services* such as habitat provisioning, maintaining grasslands and nutrient cycling which are necessary for the production of all other ecosystem services (Figure 2) [6]. Regulating and supporting services are interlinked since both provide input to the other two services. These are non-consumable, indirect services that are quite difficult to evaluate. Moreover, the two services are an output of the interaction between animals and their environment, in particular in grazing systems [7]. Therefore, for the purpose of this study, they will be explained together.

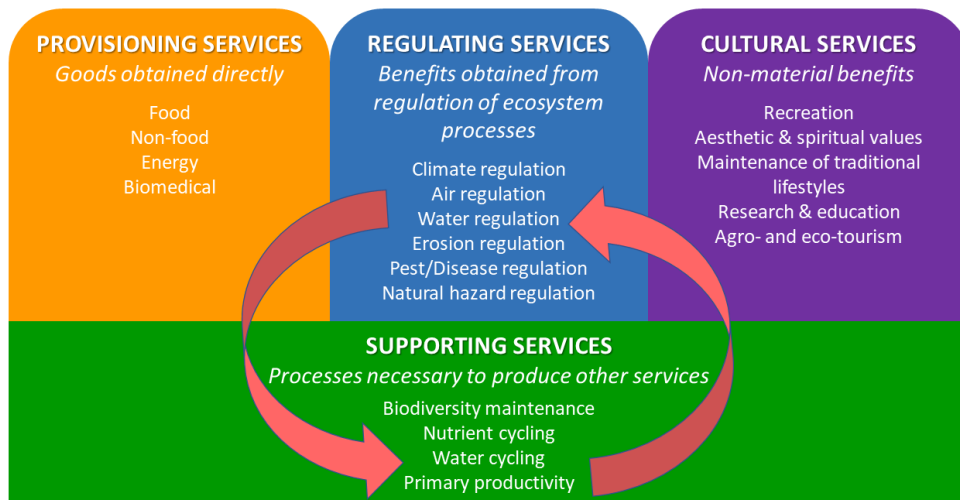


Figure 2 Ecosystem services and public goods provided by livestock production Adopted from [5, 8]

The main context of each service is mostly based on Hoffmann et al. (2014) in this paper. However, categorisation of services under different pillars was collated from a number of various studies and assessments [6, 8, 9, 10].

The ecosystem services have been taken into consideration in the EU policies. While the Common Agriculture Policy (CAP) has been supporting livestock farming based on agroecology principles in less-favoured areas in order to maintain rural and cultural vitality for many years already, it also addresses specific environmental issues in order to increase the ecosystem services provided by animal production like the Nitrates Directive, the “green” direct payments, premiums for organic farming, cross-compliance mechanisms, quality schemes and labels for products originating from local, mountainous and outermost regions. In terms of financial support and economic incentives, European Union is one of the main beef producers that is already aware of the contribution of grass-based beef systems make to the ecosystem and integrate these into policies [11]. Yet, it is still important to raise awareness and increase the recognition of the ecosystem services and public goods that the grass-based beef systems contribute to, in the society and the supply chain.

2.1 Provisioning services

Provisioning services are the most widely known and accepted ecosystem services provided. They are marketable, thus making it also easy to measure their economic value. Provisioning services cover not only the food products but also the non-food products such as hides and skins, genetic resources, fertilizer and medicinal resources.

Beef contributes to human well-being by providing high-quality proteins and fats, and particularly essential amino acids, minerals and vitamins. Grass-based beef provide consumers with healthier beef products due to its favourable fatty-acid composition forming more polyunsaturated fats. There are also studies suggesting an improved antioxidant, conjugated linoleic acid and omega-3 content in grass-based beef systems compared to concentrate or grain-based feeding systems [12, 13, 14].

On the other hand, European consumers are expecting more from their food, such as improved animal health and welfare, reduced environmental impact and increased resource efficiency. It is already known that the grass-based ruminant systems produce animal proteins and energy more efficiently, and thus use the land more efficiently than the industrial systems in terms of converting non-edible resources to edible ones [15, 16].

The genetic resources and related biotechnical advances are one of the most important non-food services beef production offers in particular in providing local breeds that are more adapted to perform under less-favoured

INSPIRATION

Dutch Dairy Association introduced the Grazing Agreement in 2012. The dairy industry has set 120 days per year and 6 hours per day as the lower limit for a dairy farm to receive the full grazing premium. Free-range dairy farms are monitored by an independent certification body. Dairy companies pick up free-range milk using a designated milk truck, and they process this milk separately from other milk at the factory. Milk that is not separated in transport cannot be processed as free-range milk. [46]

conditions, in support of improved breeding programs on resistance to diseases and adaptation to the local environment and climate change [7].

Manure is another crucial non-food product provided by grass-based beef systems as a valuable organic fertilizer replacing commercial fertilizers and also as an important source of energy, both in biomass fuel and in methane production through anaerobic digestion [17]. Manure is also one of the ecosystem services that has a trade-off between its services and disservices due to higher emission levels (nitrous oxide (N₂O), methane (CH₄) and ammonia (NH₃)) and water contamination caused by over application [18].

Other kind of provisioning services offered by beef production include human medicines, leather, and products made from the hair (e.g., air filters, brushes), skins and fibres for clothing, fat (e.g., rubber, oils), blood (e.g., adhesives, dyes and inks), hooves and horns (e.g., plastics, shampoo), organs (e.g., offal, insulin) and bones (e.g., charcoal, glass) which all contribute the economic well-being of producers as well as consumers. [19]

2.1.1 Regulating and Supporting services

Regulating and supporting services are the benefits that cannot be directly consumed by people. However, they

INNOVATION

Viva Grass Integrated Planning Tool is created and made available by the LIFE Viva Grass project in order to support decision making and planning sustainable use and management of grasslands. It enables integration of grassland ecosystem services into planning and decision making by linking biophysical grassland data (e.g. land quality, relief, land use/habitat types) with expert estimates of the ecosystem services as well as socio-economic context. The tool is integrated into an online GIS working environment and allows users; to assess the supply and trade-offs of grassland ecosystem services in user-defined areas, as well as to develop ecosystem-based grassland management and planning scenarios. The project has 9 case studies from Estonia, Lithuania and Latvia in which 2 of them included farms with organic beef production. [45]

are the internal ecosystem processes that regulate the environment thus providing humans with numerous indirect benefits. It is quite difficult to measure or value these services as they are not marketable, and their impacts are often not recognizable in the short-term. As a result, they are mostly unrecognised by the society, but in fact humans and animals depend on these services for food and other products. These are the services which could be summarised as climate, air, water, erosion, pest/disease and natural hazard regulation, habitat services and biodiversity.

Pasture-based beef production systems provide all of these services, but the weight of each service could change depending on the grazing density and grassland types. [5]

By improving grazing management and density as well as pasture management it is possible to contribute to different regulating ecosystem services such as mitigation of climate change through carbon storage in the soil and decreasing greenhouse gas emissions, preventing soil erosion, improving soil and water resources, reducing risks of floods and droughts by providing water storage, ameliorating air quality, restoring degraded grassland, conservation of habitats and aesthetic values of the landscapes [20, 21].

Sowing of better-quality

pasture for example could lead to increased forage digestibility, thus increasing daily growth rates in beef cattle. Increasing the animal and herd performance would then lead to reduced greenhouse gases emissions from enteric fermentation. [20]

Under careful grazing management with sustainable grazing densities, grass-based beef production can maintain biodiversity of both plants and animals including wildlife and migratory species. Grazing is an essential part of nature management to preserve areas of high nature value, preventing shrub invasion and afforestation. In particular in Mediterranean regions, grazing is an essential part of natural hazard management (forest fire prevention etc.) [32, 33, 34].

INNOVATION

SusCatt Project aimed to improve the yield and nutritional value of permanent pasture and meadows, using a band-tilling seeder, without relying on herbicides to destroy the existing sward during renovations. Cross-under-sowing with aggregate could destroy the weed mechanically while maintaining the local ecotypes and biodiversity of plant communities partially. It also helps replace full cultivation limiting its mineralization and associated greenhouse gas emissions. [48]



Figure 3 Local breeds from mountainous areas of Mediterranean region in Europe²

In Europe, the ruminant breeds that are used in pasture-based production systems in protected areas are mostly locally adapted or at-risk breeds. This is important in linking the habitat provision with breed conservation. In some parts of northern Europe, livestock keepers are explicitly hired to graze the animals in some areas that depend on grazing for maintenance of the habitats and prevention of fires. [5, 7]

Well-managed grazing systems have positive impacts on the primary production due to nutrient redistribution by the animals and allowing the vegetation to rest for biomass growth. This is enhanced by some rotational grazing practices of cattle leading to improved soil conditions by contributing to grass growth and preventing the invasion of unwanted plant species. [7]

INNOVATION

Regenerative Grazing is a grazing management technique that mimics natural grazing of wild cattle. It improves water infiltration, soil fertility, farm income and profitability while reducing erosion and costs. *Adaptive (high stock density) grazing* can be used both on perennial pasture and annual forages e.g. grazing cover crops or crop stubble. Pasture Project in US and LifeRegen Farming project in Spain both aim to advance this to practice and grass-fed value chains. [50, 51]

Nutrient cycling is estimated to provide the most significant contribution to the total value of ecosystem services, around 51%. Dung and manure, as well as cattle feeding on crop residues, contribute to nutrient cycling services provided by grass-based beef systems. [7] Besides, most of the European pasture-based beef cattle are grazed in marginal lands and protected areas that are not suitable for other agricultural activities. By avoiding overgrazing and applying good grazing

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Some examples of dual-purpose and beef cattle breeds for the preservation of pastures in particularly in mountainous areas are Tarentaise in France, Valdostana cattle in Italy, and Parda de Montaña and Pirenaica cattle in Spain, Cika cattle in Slovenia. The grazing of these cattle is also perceived valuable in the control of avalanches. [7].

Integrated crop-livestock production systems provide services as weed control and waste recycling, the latter by adding value to crop residues and by-products. In this way non-edible feed is recycled to valuable proteins and energy. The ecosystem services provided depend on the synergies in these mixed farms. [22] Mixed farms, in particular crop and grazing livestock farms, benefit the most from the positive impact of manure on soil fertility and weed management. [10, 19]

INNOVATION

CAP²ER[®] is a multicriteria tool developed by French Livestock Institute IDELE to evaluate the sustainability of ruminant farms. It includes indicators of ecosystem services and disservices as well as ones on economic and working conditions to evaluate the sustainability. As a result, economic, social and environmental aspects of sustainability are all taken into account. [49]

²Photo credits: Left Cika cattle by Roman Maurer; up-middle Valdostana, up-right Tarentaise cattle by Josep Renalias Lohen11; down-middle Parda de Montaña by <http://zaragozasalvaie.blogspot.com>; down-right Pirenaica cattle by Francis40

management, services provided by the grazing beef cattle could be increased in nutrient and water cycling. While it has been long argued that some of the local breeds are more resistant to some diseases, the benefits of grazing cattle on preventing the spread of various human diseases is not as recognised. Richter and Matushka (2007) suggest that increasing the traditional low-intensity cattle grazing in central Europe may help reduce the risk of Lyme disease.

Leroy et al. (2018) analysed the responses of a global stakeholder survey in order to compare the impact assessment of local stakeholders on grazing activities of livestock species between Europe and the rest of the world. A vast majority of European respondents reported that livestock systems in mountainous and Mediterranean grasslands have positive impacts for bush encroachment, weed eradication, seed dispersal, erosion control and water quality control.

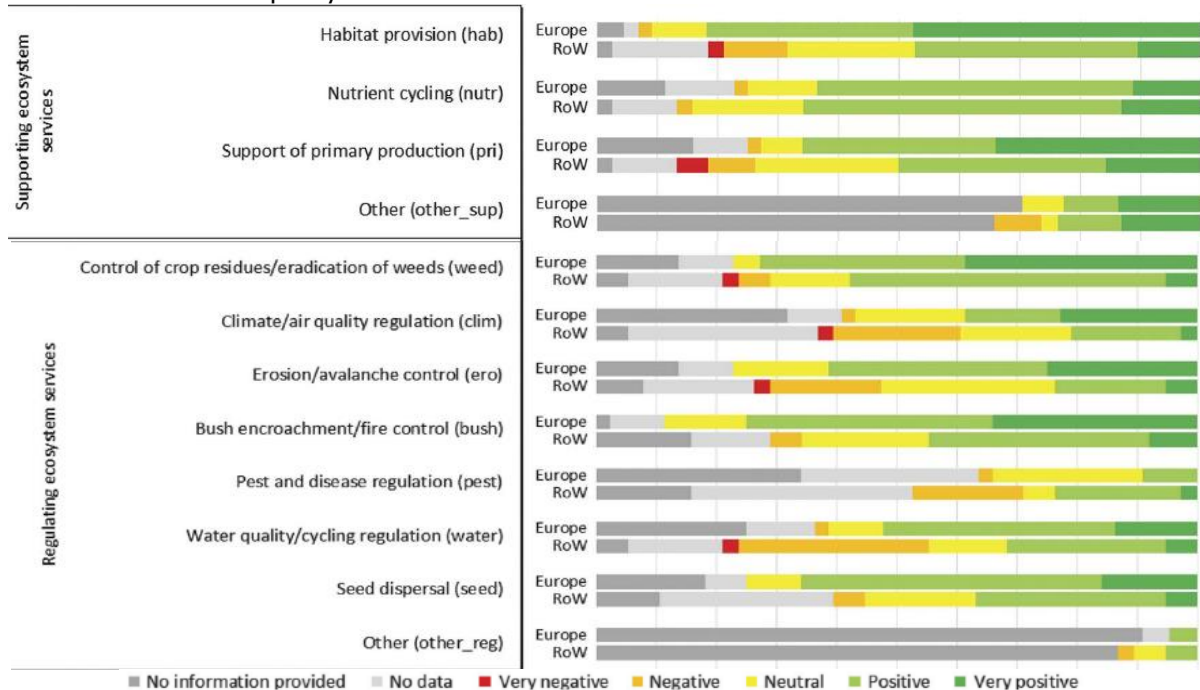


Figure 4 Impacts of grazing livestock on regulating and supporting ecosystem services in Europe and rest of the world (RoW) reported by respondents [11]

2.1.2 Cultural services

Grass-based beef systems contribute to the mental and psychological well-being of human beings by providing services that are not materials but more spiritual or cognitive. By maintaining the rural vitality, they ensure that the traditions and cultural heritage linked to beef production is sustained. These traditions and heritage increase the aesthetic values and landscape not only for the local communities but also for the tourist that admire the beauty of the historical values, traditional production systems and thus the high-quality local products. One of the primary services provided by the pasture-based beef production is the increased agro- and eco-tourism practices. These areas are also becoming attractive spots due to the multifunctionality of livestock grazing and grasslands in increasing the heterogeneity of the landscape with more plant and forb species and increased aesthetic values by more flowering forbs. [23] Ecosystems also have a significant role in transferring the accumulated traditional and cultural knowledge and educational values to the next generations.

Bernués et al. (2015) suggest that the cultural values are recognised mainly in the society and that the people prefer a policy that supports the pasture-based livestock to maintain the ecosystem services it provides. (Figure 5) [24]

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BurrenLIFE project in Ireland is a good example of knowledge transfer and development in order to conserve and support the heritage, environment and communities. It extended the winter grazing on traditional winterages by 25%, formulated a supplementary feed leading to 61% less silage use, improved water facilities to prevent undersupply, improved farm infrastructure with local labour, created access to grazing winterages and cleared scrub from priority habitats. The project exceeded its pilot farms and launched "Farming for Conservation Programme [44, 52]

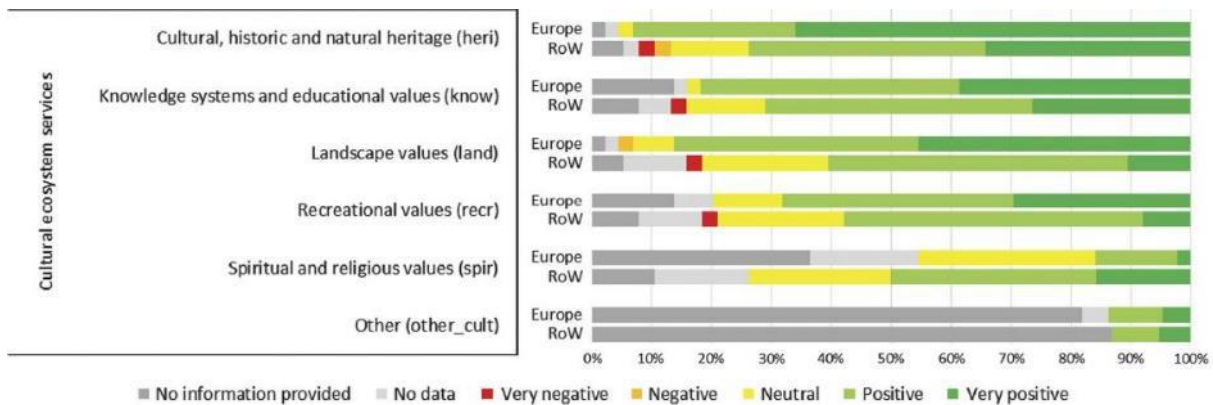


Figure 5 Impacts of grazing livestock on cultural ecosystem services in Europe and the rest of the world (RoW) reported by respondents [11]

2.2 Bottlenecks: economic, social, labour, environmental

The EU beef sector started to face significant economic, social and environmental challenges already after the BSE crisis in the late 90s. It is assumed to have affected the development of the beef sector, prices, consumer trends and farm characteristics [25]. The EU beef sector is still facing some challenges related to farmer demographics and income, environmental impacts and climate change, prices, profitability, aftereffects of the milk quota abolition, perception of the society, changing consumer demands, competition with imported goods and, not but least national, European and international policies and markets. [1] These factors need to be taken into consideration and addressed in order the beef production to remain sustainable in the coming years.

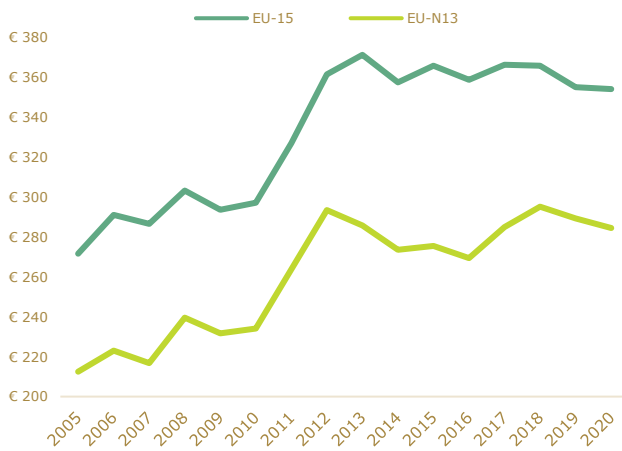


Figure 6 Evolution of cattle slaughter prices and farm income of specialist beef farms in the EU-15 and EU-N13 between 2005-2020³ (€/100 kg) Based on [26]

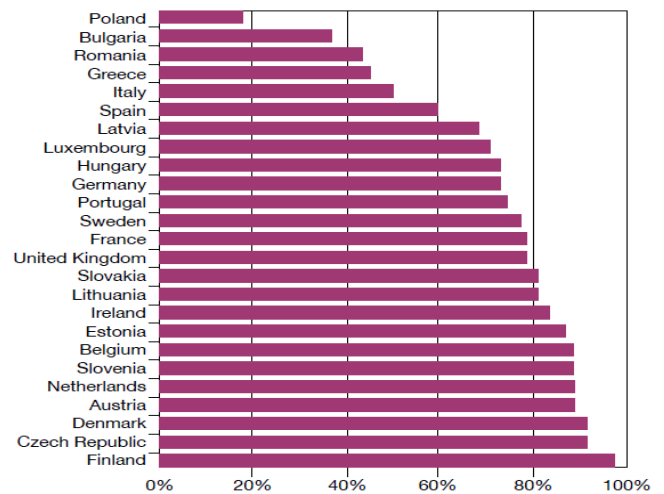


Figure 7 Food sales market share of the top 5 food retail companies in the EU (2010) by Gira compilations [27]

2.2.1 Economic

EU grass-based beef production is quite concentrated where it is mainly located in the mountainous regions of France, Spain, Italy, Ireland and the UK where another agricultural production is either not possible or mixed with either crop or other grazing ruminants. These beef farms usually have a significant share in the total income of the whole region, which makes the rural households and the entire rural community quite sensitive to any price and/or policy changes. On the other hand, the analysis of the Direct Payment Scheme and farm incomes show that the EU beef farms are relying for more than 100% of their income on the Common Agricultural Policy payments.

³ 2020 data is the average of January and February.

INSPIRATION

Natuurvleescoöperatie is a producer and supplier of affordable sustainable healthy and tasty meat, coupled with nature management, social inclusion, cycle economics and strengthening of the regional economy in Groningen, the Netherlands. The establishment of a sustainable nature chain involves beef producers, slaughterhouses, food wholesale companies, large scale consumers and local government. The starting point is to form a sustainable partnership that promotes cooperation, involving all stakeholders appropriately in decision making and each receives a fair share of added value. [54]

The productivity levels of specialised beef farms differ significantly among regions, whereas it is highest in the south-western areas and lowers in the north-eastern regions indicating substantial regional differences. All these differences lead to EU-N13 countries to be affected more by changing consumer trends or international markets and see sharper decreases in production levels and farm numbers compared to EU-15. This in return leads to more concentration of production [1] and thus increasing the risk of abandonment of cattle grazing in the less-favoured areas of EU-N13 resulting in the loss of ecosystem services and public goods provided by the grass-based beef herds.

There are also challenges for the supply chain where the sector is already facing low margins in processing and capacity utilisation challenges. Main factors affecting the situation are the cost pressures resulting from imports, over-capacity, increased concentration and power of retail, high animal prices and varying labour costs in the EU. [1, 27]. In addition, meat consumption is already decreasing in the EU, leading to a shrinking intra-EU market while it is already quite difficult for the EU to gain market share in the highly competitive world market.

The difficulties in economic valuation of the ecosystem services provided by the grass-based beef systems hinder their recognition resulting in challenges promoting and marketing of agro-ecological products.

2.2.2 Social

The main societal challenge for the EU beef sector is the overall image and perception of beef production, thus leading to a decreasing consumption trend. The industry is being questioned constantly about the nutritious quality of the beef, how animal welfare and health is handled, its environmental footprint and its impact on climate change. Changing consumer preferences towards less or non-animal proteins in particular among the young generation could well be considered as a threat. Moreover, under-recognition of the ecosystem services and public goods provided by grass-based beef systems by the society and consumers would also challenge the sector as a whole affecting the marketing of the quality products.

2.2.3 Labour

Labour is one of the main challenges for grass-based beef farms together with the ageing farmer demographics. While on the one hand, it is difficult to find trained, livestock keepers in particular in grazing periods, the average labour income variability among different parts of the EU is another critical challenge. The highest labour incomes are found in northern parts of Italy, Spain and Finland whereas labour income is significantly lower in the north-eastern parts of the EU and west Germany, south-western France and southern half of the Iberian Peninsula [1].

2.2.4 Environmental

It is not easy to draw boundaries between the ecosystem services and disservices of grass-based beef systems. [10] The beef sector is very heterogeneous in itself; farm types vary from only grazing to mixed systems, whereas grazing systems also differ in terms of management, livestock density and productivity. Many trade-offs exist between different ecosystem services, making it difficult to evaluate the positive and negative impacts only by itself. [28]

Main environmental challenges for grass-based beef systems could be summarised as degradation of vast grassland areas, carbon emissions, biodiversity losses, genetic erosion and negative impacts on water flows and quality. [28] High stocking densities are an ongoing discussion at EU level, in particular about the beef production in Benelux, north and south of the Alps and north-western France. National or European regulations aiming to address such societal and environmental concerns with stricter regulations would negatively affect the level

INSPIRATION

REKO is a retail and distribution model offering customers a way of ordering products directly from the producer, without the need for middlemen. It operates via Facebook as closed groups in which orders and deliveries are arranged. The groups are run by volunteers aiming to bring products of small-scale producers directly to consumers at a reasonable price for both. Main principles are that there are no retail sales, products are ethically produced preferably organic, open and transparent information. [53]

playing field within Europe and weaken the position of EU beef sector at international markets thus causing an unintended threat to the economic viability of the industry and the regions [1].

Grass-based beef systems are also challenged by land limitation in the EU as total agricultural land use is expected to decrease, affecting the available grasslands in the coming ten years due to the competition from non-agricultural uses. Further, beef production will most likely have to compete with other agricultural productions for land as well. [29] Therefore, the availability of land for the production to be extended and the increase of the herd size is expected to remain limited in the coming future in particular for the northern countries of the EU where intensification is already high. [30]

Another important bottleneck for the grass-based beef systems is the argument on “efficiency gain”, which advocates that the more productive and efficient a system is, the less environmental impact it has. However, it is important to look at the bigger picture on efficiency of the whole system rather than only at animal level and only product per kg level. [10]

2.3 Good communication strategies & tools

There are several good communication practices both from the European countries and from other countries focusing on reaching out to society and consumers to better communicate about production and feeding systems, inform about the production process and how animals are handled, and market their products with transparency. These best practice communication strategies and tools are examples for improving knowledge on agricultural production, for increasing recognition to a specific technique or farming type and for setting standards to increase the transparency in marketing.

Most of these initiatives are led by a couple of pioneer farmers who are willing to provide the consumers with high-quality products and are supported by local, national and/or European researchers, policymakers and or funding bodies. Some others are established with the initiatives of the local governments. Below is a selection of these success stories.

2.3.1 Improve knowledge about food and agriculture



Land schafft Leben – Land creates life (Austria): This is an initiative of Hannes Royer, an Austrian mountain farmer aiming to provide transparent and independent information on the production chain to raise awareness of the value of Austrian food. The initiative would like to show the consumers the reality without any marketing or scandalizing. They examine and investigate the whole sector by visiting, interviewing different stakeholders of the whole supply chain, including consumers. The research and validation of the information are characterised by a high level of detail and a critical approach. They prepare the generated knowledge in an understandable and vivid way for the consumers. There is also the possibility of attending an online training targeting school children on how specific products are produced while there are various workshops for adults. Their sponsors are Austrian food producers and processors, representatives of the Austrian food trade, as well as other companies and individuals who are interested in raising awareness of Austrian food. [31]



NFU Education was established in 2017 as part of the NFU's drive to reconnect children with rural life, develop their understanding of farming and increase their awareness of the field-to-fork journey. Since then the team has rolled-out education initiatives and teaching resources across England and Wales. The three main goals are to save teachers time and reduce workload, to spark learners' passion and enthusiasm for STEM (Science, Technology, Engineering and Maths) subjects, to convey important messages about food, farming and nutrition through a cross-curricular, project-based approach. The NFU's education programme is focused around STEM and brings the countryside into the classroom, delivering positive outcomes for both pupils and teachers. They have launched Farmvention, STEMterprise, speakers for schools, science farm resources for creating awareness on different stages of farming. [32]



Beef.ch Cattle experience: It promotes dialogue between farmers and consumers, between town and country, to strengthen the reputation of beef production as an important branch of agriculture and to bring it closer to a broader population. Consumers could gain insight into the quality thinking of the Swiss meat industry. There are different events where consumers can visit suckler cows, calves and bulls and learn how beef is produced. [33]



Amos Venema: By using social media and other public channels, Amos Venema became a known blogger, and he aims to fill the gap between farmers and consumers. The farmer describes his daily

life and his farm work in a clear and simple way. He comments on current agricultural policy and explains how farmers are affected. Due to transparency and positive descriptions a high acceptance is created. [34]

2.3.2 Increase recognition on specific farming type and production

KIPSTER *Kipster "Carbon Neutral Eggs"*: This is an example of increasing awareness of sustainable production by creating a climate-neutral poultry company from the Netherlands. The marketing is only through Lidl bypassing the traditional routes of marketing. The brand achieved to attain the highest quality seal from the Dutch Society for Animal Protection despite not being organic or free-range. It sets up an example of a new sustainable business model by defining itself as animal-, climate- and farmer-friendly. They support waste recycling by converting these into eggs through feeding chickens with waste from the food industry. In addition, they also run an education centre for the consumers. They are also addressing the concerns of the citizens on the disposal of 1-day-old chicks by feeding the male chicks and market the meat as "rooster burger". [35, 36]



Aysun the Sütçü: A farm in Istanbul which produces and sells free of disease raw milk from free-range, extensive dairy cows have started to reach out to whole Istanbul with a new business model. She set up a delivery channel to sell daily raw milk to consumers all over Istanbul by making contracts with special delivery trucks and initiating the legalisation of raw milk sales in Turkey. She has several projects that made her known through some well-known chefs and her products are promoted by these chefs all over Turkey. She constantly receives volunteers from the big cities to work on her farm experiencing dairy farming and creating awareness to sustainable animal and environmentally friendly dairy farming. She is organising workshops for building eco-friendly houses with natural products like dung, strawbale and slip straw. She also has an ongoing project to set up environmentally sustainable villages in each city with urban-rural migrants to provide the consumers with healthy and eco-friendly products. [37]

2.3.3 Increase the transparency in marketing



Elevage de Finson: A farm in Belgium with Limousin organic beef production installed its butchery shop in the farm in 2011 since the high-quality meat was not sufficiently paid in the region. The farm started to raise sheep and rabbits to widen the product range. Pork and beef carcasses are also purchased from neighbouring farms. Collaboration is organised in short cycle due to the presence of an organic slaughterhouse nearby (10 km). No publicity is done, except through Facebook (weekly special offers) which brings a lot of local consumers. The quality of the products is now also well reputed for remote consumers due to developing tourism in the area. The butcher shop has won several "Coq de Cristal" (a contest of the Walloon region rewarding quality products). [34]



Marguerite Happy Cow: The cooperative Marguerite Happy Cow exists since 2015 and brings together regional dairy farms and processors. In 2017, 9 farmers, one feed processor and 2 cheese factories joined their forces in order to establish a cooperative to produce high-quality milk, based on grass and local production. Another objective is to provide that the producers receive a fair income for the quality production. Consumers are also allowed to take part in the cooperative. Production requirements are discussed between cooperative members and are controlled by an external certification body. The 5 key requirements for Marguerite Happy Cow are grass and pasture conditions, local feed (and non-GMO), specific milk quality, human scale and fair income, and local processing. [34]



Liivimaa Lihaveis – State Certified Grass-Fed Beef (Estonia) and its brand "Nordic Meats": This initiative connects around 50 farmers, who raise organic grass-based beef cattle in the Baltic grasslands containing more than 70 species per square meter. Liivimaa Lihaveis has created a governmentally certified quality scheme - ensuring welfare of the animals and sustaining the biodiversity on the diverse grasslands. Moreover, every single member is certified organic producer. In addition to the animal welfare, it also advocates for sustainable agricultural policies. 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 ENJOY, IT'S FROM EUROPE. There is also link to its marketing brand "Nordic Beef". [38]



"Natura-Veal" and "Natura-Beef" from Beef Cattle Switzerland: Beef Cattle Switzerland is the service organization of Switzerland's suckler cow and beef cattle breeders. It consists of beef herdbook, swiss beef cattle, marketing via Natura-Veal, Natura-Beef, SwissPrimGourmet and Premium brands, and communication and lobbying services. To produce meat in an animal-friendly fashion in nature, comprehensive regulations governing the keeping and feeding of the animals are laid down. The feed consists mainly of the suckler cow's milk, with the later addition of grass, hay and cereal flakes. The use of growth-enhancing additives, animal proteins, soya, palm oil or fat and genetically modified animal feed is prohibited. SwissPrimGourmet stands for top-class Swiss gourmet beef and pork. In addition to stringent quality requirements regarding the meat, the label

programme is characterised by animal-friendly husbandry, natural feed and 100% traceability. In this way the label programme meets the high expectations of consumers with respect to quality, livestock farming conditions and ecology.



Origin Green "European Beef & Lamb": Origin Green is Ireland's pioneering food and drink sustainability programme, operating on a national scale, uniting government, the private sector, farmers and food producers. It is a voluntary programme, led by Bord Bia (the Irish Food Board). Independent accreditation and verification are built into every stage of the supply chain. Origin Green encourages



sustainable farming and expands the scope and depth of sustainability measures tracked, in order to ensure that the programme delivers an assessment system which measures what matters. The additional sustainability criteria being measured to date, as part of Origin Green include greenhouse gas; biodiversity; water measures; energy efficiency; soil management and socio-economic factors. [39]



Pasture for Life: The Pasture-Fed Livestock Association brings together British farmers committed to producing high quality food in a more natural way. The standards that define Pasture for Life farming are firmly rooted in the practical experience of the farmers. They are the foundation underpinning the Certification Mark, which helps consumers identify meat and dairy produced this way. Pasture for Life provides an important distinction over food produced by more intensive methods. As such it may attract a price premium when sold. There is application process for farmers, butchers and

dairies. Its website provides the consumers with information on the benefits of pasture-based beef and the ecosystem services, where to buy the products labelled with Pasture for Life, and information for producers and processors to become certified. [40]

3 Innovation

The beef sector has been facing important challenges like labour flow from agriculture, ageing farmers, competition for agricultural land, increasing environmental and climate change concerns, higher animal health and welfare expectations, as well as consumer expectations on food safety and health. Some of these challenges could be perceived as opportunities for the grass-based beef systems, presuming that they are based on agroecology principles. However, in order to ensure the sustainability of grass-based beef systems in the EU, ecosystem services and public goods they offer should be better evaluated and recognised by the researchers, policymakers, rural communities, farmers, supply chain stakeholders and citizens. The future of the beef sector in the EU lies in better valorising these ecosystem services through innovative approaches, best practices and new technologies.

Innovation under the EIP-AGRI is described as **"a new idea that proves successful in practice"**. It may be technological, non-technological, organisational or social, and based on new or traditional practices. A new idea can be a new product, practice, service, production process or a new way of organising things, etc. Such a new idea turns into an innovation only if it is widely adopted and proves its usefulness in practice. This will depend not only on the new idea itself, but also on the market possibilities, the willingness of the sector to take it up, cost-effectiveness, knowledge and perceptions, accidental external factors etc. The EIP-AGRI aims at supporting innovation following the interactive approach, where farmers, advisors, researchers NGOs, businesses, etc. co-create innovations in a bottom-up process. The innovations generated with an interactive approach tend to deliver solutions that are well adapted to circumstances and which are easier to implement since the participatory process is favourable to speeding up the introduction, dissemination, and acceptance of the new ideas.

Multiplication of the results of interactive innovation projects in particular works through farmers' peer to peer communication, or through the integration of the solutions into the day-to-day advice of advisors to their client-farmers. Often pioneer farmers are the first interested to test out new ideas, but they may also convince and show the way for the broader farmer community on the somewhat longer term. [41]

It is important to ensure that the innovations in beef production are taking into consideration the ecosystem services and public goods as well as improving productivity and / or eco-efficiency, thus making it also socially responsible. It also needs to consider the impacts of the proposed actions at different levels of supply chain such as on-farm, across farming landscapes and industries, rural communities and populations, and throughout the food chain including consumers and citizens. [42] The sustainability of the sector depends on how much these innovative approaches increase its resilience and efficiency while at the same time reducing its dependence on public support [43]

Below are some open questions for the Focus Group to reflect and discuss.

- **Product**
 - What are the criteria for qualifying as grass-based beef systems?
 - What kind of changes in the business models would encourage younger generations?
 - How could the breeding and genetics address some of the main challenges of grass-based beef systems?
 - What would be the main precision livestock farming technologies to be developed in order to facilitate working conditions for farmers?
 - How could the entrepreneurship of producers be supported/built?
- **Marketing and organisational models**
 - How efficient and effective are the different labels in encouraging a more sustainable beef production?
 - What are possible new initiatives for the gap between producer-processor-retailer to be closed?
 - What are possible different market organisation models to sell high-quality beef without certification or labels?
 - Could the grading system in the EU be modified/updated to increase the intrinsic quality⁴ and pricing of beef?
- **Process**
 - How could we increase the benefits from grass-based beef for the farmers which in return would affect the agroecosystem positively?
 - How can we further differentiate the value-chains to valorise the high-quality products more for both intrinsic and extrinsic qualities⁴?
 - Which ecosystem services and public goods are more prominent for valorisation, taking into consideration the societal perception of beef production and rural vitality?
 - How can we reflect the ecosystem services and public goods that are not valorised in the pricing system?
 - Can social media and Information and Communications Technology help add value to the products?

⁴ Intrinsic qualities consist of the characteristics of the product itself (taste, smell, flavor, color, palatability), while extrinsic qualities refer to external characteristics such as sustainability, environmental impact, animal health and welfare, public health. [47]

References

- [1] R. Ihle, L. Dries, R. Jongeneel, T. Venus and J. Wesseler, "Research for AGRI Committee - The EU Cattle Sector: Challenges and Opportunities - Milk and Meat," European Commission, Brussels, 2017.
- [2] M. Scott Cato, *Green Economics: An Introduction to Theory, Policy and Practice*, London: Earthscan, 2009, pp. 35-55.
- [3] ERBS, "Principles for Sustainable Beef Farming," 2013. [Online]. Available: <https://saipatform.org/uploads/Modules/Library/sai-platform-principles-for-sustainable-beef-farming-final.pdf>. [Accessed 10 03 2020].
- [4] A. Escribano, "Beef Cattle Farms' Conversion to the Organic System. Recommendations for Success in the Face of Future Changes in a Global Context," in *Sustainable Agriculture—Beyond Organic Farming*, 1 ed., S. Clark, Ed., MDPI, 2016, p. December.
- [5] FAO, "The contributions of livestock species and breeds to ecosystem services," 2016.
- [6] T. Rodríguez-Ortega, E. Oteros-Rozas, R. Ripoll-Bosch, M. Tichit, B. Martín-López and A. Bernués, "Applying the ecosystem services framework to pasture-based livestock farming systems in Europe," *Animal*, vol. 8, no. 8, pp. 1361-1372, 2014.
- [7] I. Hoffmann, T. From and D. Boerma, "Ecosystem," FAO, Rome, 2014.
- [8] Millennium Ecosystem Assessment, "Ecosystems and Human Well-being: Synthesis.," Island Press, 2005.
- [9] TEEB, "The Economics of Ecosystems and Biodiversity Ecological and Economic Foundations," Earthscan, London and Washington, 2010.
- [10] A. Bernués, "Animals on the land: ecosystem services and disservices of grazing livestock," in *The Meat Crisis: Developing more sustainable and ethical production and consumption*, 2 ed., J. D'Silva and J. Webster, Eds., earthscan, 2017.
- [11] G. Leroy, I. Hoffmann, T. From, S. Hiemstra and G. Gandini, "Perception of livestock ecosystem services in grazing areas," *Animal*, vol. 12, no. 12, pp. 2627-2638, 2018.
- [12] C. Daley, A. Abbott, P. Doyle, G. Nader and S. Larson, "A review of fatty acid profiles and antioxidant content in grass-fed and grain-fed beef," *Nutritional Journal*, vol. 9, no. 10, 2010.
- [13] E. Ponnampalam, N. Mann and A. Sinclair, "Effect of feeding systems on omega-3 fatty acids, conjugated linoleic acid and trans fatty acids in Australian beef cuts: potential impact on human health," *Asia Pac J Clin Nutr*, vol. 15, no. 1, pp. 21-29, 2006.
- [14] M. Van Elswyk and S. McNeill, "Impact of grass/forage feeding versus grain finishing on beef nutrients and sensory quality: The U.S. experience," *Meat Science*, vol. 96, no. 1, pp. 535-540, January 2014.
- [15] J. Wilkinson, "Re-defining efficiency of feed use by livestock," *Animal*, vol. 5, no. 7, pp. 1014-1022, 2011.
- [16] H. van Zanten, H. Mollenhorst, C. Klootwijk, C. van Middelaar and I. de Boer, "Global food supply: land use efficiency of livestock systems," *Int J Life Cycle Assess*, vol. 21, pp. 747-758, 2016.
- [17] W. Baltussen, T. Achterbosch, E. Arets, A. de Blaeij, N. Erlenborn, V. Fobelets, P. Galgani, A. De Groot Ruiz, R. Hardwicke, S. Hiemstra, P. van Horne, O. A. Karachalios, G. Kruseman, R. Lord, W. Ouweltjes, M. Tarin Robles, T. Vellinga and L. Verkooijen, "Valuation of livestock eco-agri-food systems: poultry, beef and dairy," Wageningen University & Research, Trucost & True Price, Wageningen, 2017.
- [18] H. Aguirre-Villegas and R. Larson, "Evaluating greenhouse gas emissions from dairy manure management practices using survey data and lifecycle tools," *Journal of Cleaner Production*, vol. 143, pp. 169-179, 1 February 2017.

- [19] S. Pogue, R. Kröbel, H. Janzen, K. Beauchemin, G. Legesse, D. M. de Souza, M. Iravani, C. Selin, J. Byrne and T. McAllister, "Beef production and ecosystem services in Canada's prairie provinces: A review," *Agricultural Systems*, vol. 166, pp. 152-172, 2018.
- [20] P. Thornton and M. Herrero, "Potential for reduced methane and carbon dioxide emissions from livestock and pasture management in the tropics," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 107, no. 46, pp. 19667-19672, November 2010.
- [21] R. Follett and D. Reed, "Soil Carbon Sequestration in Grazing Lands: Societal Benefits and Policy Implications," *Rangeland Ecology & Management*, vol. 63, no. 1, pp. 4-15, January 2010.
- [22] FAO, "Livestock and agroecology," 2018.
- [23] H. Ford, A. Garbutt, D. Jones and L. Jones, "Impacts of grazing abandonment on ecosystem service provision: Coastal grassland as a model system," *Agriculture Ecosystems & Environment*, vol. 162, pp. 108-115, November 2012.
- [24] A. Bernués, T. Rodríguez-Ortega, F. Alfnes, M. Clemetsen and L. Eik, "Quantifying the multifunctionality of fjord and mountain agriculture by means of sociocultural and economic valuation of ecosystem services," *Land Use Policy*, vol. 48, pp. 170-178, November 2015.
- [25] H. Ye, "The impact of the BSE crisis on the European beef industry structure," 2014. [Online]. Available: <https://edepot.wur.nl/296153>. [Accessed March 2020].
- [26] EC, "EU prices for selected representative products," 2020. [Online]. Available: https://ec.europa.eu/info/food-farming-fisheries/farming/facts-and-figures/markets/prices/price-monitoring-sector/eu-prices-selected-representative-products_en. [Accessed 21 March 2020].
- [27] GIRA, "Putting meat on the bones," EFFAT, 2011.
- [28] FAO, "Livestock's long shadow: environmental issues and options," Rome, 2006.
- [29] EC, "EU agricultural outlook for markets and income, 2019-2030," European Commission, Brussels, 2019.
- [30] J. Hocquette and V. Chatellier, "Prospects for the European beef sector over the next 30 years," *Animal Frontiers*, vol. 1, no. 2, pp. 20-28, October 2011.
- [31] LandSchafttLeben, "Land Schafft Leben," 2020. [Online]. Available: <https://www.landschafttleben.at/>. [Accessed March 2020].
- [32] NFU, "NFU Education," 2020. [Online]. Available: <https://education.nfuonline.com/>. [Accessed 2020].
- [33] BCS, "Beef Cattel Switzerland," 2020. [Online]. Available: <https://www.mutterkuh.ch/en>. [Accessed 2020].
- [34] Inno4Grass, "Inno4Grass," 2020. [Online]. Available: <https://www.encyclopediapratensis.eu/product/inno4grass/farmer-portrait/finsonbreeding/>. [Accessed 2020].
- [35] Kipster, "Kipster Farm," 2019. [Online]. Available: <https://www.kipster.farm/>. [Accessed 2020].
- [36] Rabobank, "Kipster – have they cracked it?," April 2018. [Online]. Available: <https://www.rabobank.com/en/raboworld/articles/kipster-how-have-they-cracked-it.html>. [Accessed 2020].
- [37] Gundonumu, "Aysun the Sutcu," 2020. [Online]. Available: <http://gundonumu.biz.tr/>. [Accessed 2020].
- [38] Grassfedbeef, "Liivimaa Lihaveis," 2020. [Online]. Available: <http://grassfedbeef.eu/>. [Accessed 2020].
- [39] EBL, "European Beef & Lamb," 2017. [Online]. Available: <http://www.europeanbeef-lamb.hk/>. [Accessed 2020].
- [40] Pasture For Life, "Pasture for Life," 2011. [Online]. Available: <https://www.pastureforlife.org/>. [Accessed 2020].

- [41] EC DG AGRI, "Guidelines on programming for innovation and the implementation of the EIP for Agricultural Productivity and Sustainability, Programming Period 2014-2020," December 2014. [Online]. Available: https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-guidelines-july-2014_en.pdf. [Accessed April 2020].
- [42] D. Rose and J. Chilvers, "Agriculture 4.0: Broadening Responsible Innovation in an Era of Smart Farming," *Front. Sustain. Food Syst.*, vol. 2, no. 87, 21 December 2018.
- [43] A. Theodoridis, "Future challenges and innovative solutions for the sheep and goat sector," 2020.
- [44] BurrenProgramme, "Burren Life Programme," 2015. [Online]. Available: <http://burrenprogramme.com/>. [Accessed March 2020].
- [45] Life Viva Grass, "Life Viva Grass," 2020. [Online]. Available: <https://vivagrass.eu/category/naujienos/>. [Accessed March 2020].
- [46] NZO, "Grazing," 2020. [Online]. Available: <https://www.nzo.nl/en/sustainability/grazing/>.
- [47] P. Purslow, "What is meat quality?," in *New Aspects of Meat Quality: From Genes to Ethics*, P. P. Purslow, Ed., Woodhead Publishing, 2017, pp. 1-9.
- [48] J. Barszczewski and T. Sakowski, "Cross-undersowing: improving permanent pasture without herbicides," 2020.
- [49] Idele, "CAP'2ER," 2020. [Online]. Available: <http://idele.fr/services/outils/cap2er.html>.
- [50] LifeRegenFarming, "LifeRegenFarming," 2013. [Online]. Available: <http://regenfarming.eu/>.
- [51] PastureProject, "Pasture Project," 2020. [Online]. Available: <https://pastureproject.org/>.
- [52] BurrenLIFE, "BurrenLIFE - Farming for conservation in the Burren," 2010. [Online]. Available: https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=2661.
- [53] Interreg, "Good practice: REKO local food market with digital ordering system," June 2013. [Online]. Available: <https://www.interregeurope.eu/policylearning/good-practices/item/3601/reko-local-food-market-with-digital-ordering-system/>.
- [54] NorthSeaRegion, "Reframe: Sustainable Beef Production," 2016. [Online]. Available: <https://northsearegion.eu/reframe/innovation/sustainable-beef-production/>.