# Rendered Services and Dysservices of Dairy Farming to the Territories: A Bottom-up Approach in European Atlantic Area

C. Perrot [1]*[iD], H.J. Ferguson [2], M. Mulholland [3], A. Brown [3], C. Buckley [4], J. Humphrey [4], K. Scully [4], M. Dorigo [5], P. Legrain [6], T. Bodin [7], O. Girma [7], P. Merino [8], E. Rosa [8], H. Arriaga [8], C. Resch [9], I. Vasquez [10], M.J. Gomes [11], H. Trindade [11], J.C. Almeida [11], S.R. Silva [11], D. Fangueiro [12], A. Almeida [12]

[1] Département Economie de l'Institut de l'Elevage, Institut de l'Elevage Paris, France.

[2] Dairy Research and Innovation Centre, Scotland's Rural College (SRUC), Dumfries, UK.

[3] Department of Agriculture, Environment and Rural Affairs (DAERA), Belfast, UK.

[4] Agriculture and Food Development Authority (TEAGASC), Carlow, Ireland.

[5] Agriculture and Horticulture Development Board (AHDB), London, UK.

[6] Chambre régionale d'agriculture de Normandie, Caen, France.

[7] Chambre régionale d'agriculture de Bretagne, Rennes, France.

[8] Basque Institute for Agricultural Research and Development (NEIKER), Alava, Spain.

[9] Axencia Galega da Calidade Alimentaria (AGACAL), A Coruña, Spain.

[10] University of Santiago de Compostela, Santiago, Spain.

[11] University of Trás-os-Montes and Alto Douro (UTAD), Vila Real, Portugal.

[12] LEAF, Instituto Superior de Agronomia, ULisbon, Portugal.

## Abstract

The Dairy-4-Future project focuses on improving the sustainability of dairy farming in the UK, Ireland, France, Spain, and Portugal. Improvement in dairying sustainability can be achieved by supporting and expanding the positive impacts and services that dairy farming has upon, and offer to, the local communities and by reducing the disservices, or negative impacts associated with dairying. To create a qualitative identification of a relevant, ranked list of items or issues associated with dairying in each territory in the project, interactive workshops with local stakeholders were organized in each regional case study. Stakeholders identified positive or negative impacts of local dairy farming on their territories, broken down into four specific categories: provisioning (e.g., food), rural vitality, environmental quality, cultural heritage, and quality of life. A total of 165 services and 135 dysservices were identified, balanced across the four categories. From these services and dysservices, groupings showed correlations between items and/or territories (for example, between Northern Ireland and Cornwall; Southern Ireland and Normandy; Galicia and Brittany). The impact of farm system type, specifically grassland, played a strong role in the linking of services and dysservices.

*Keywords:* Dairy Farming; Services; Dysservices; Territories.

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## 1. Introduction

The concept of multifunctionality was first explored in literature in 1992, during the summit of Rio, together with that of *sustainable development*. Multifunctionality of production systems aims to specify the range of *roles* that livestock farming can play, examining all its purposes for society. Multifunctionality therefore looks to consider all the *functions* related to agricultural activities beyond commerce and the production of foodstuffs. Indeed, livestock farming generates negative *impacts* (dysservices) on the environment, due to the consumption of inputs and greenhouse gas emissions [1-3], but it also provides *services* (positive impacts)**,** particularly in relation to grasslands. This is precisely how Duru et al. (2017), adapted from Dumont et al. (2016) [4], organize the terms above in bold, to provide a conceptual framework for analyzing the diversity of services and impacts resulting from livestock farming in different territories. Ryschawy et al. (2015) identified four categories of services provided by livestock farming in different territories: supply (quantity and quality of animal products), environmental quality (biodiversity, biogeochemical cycles, diversity of landscapes), territorial vitality (rural dynamism and employment), and cultural heritage (gastronomy, identity) [5–7].

Some scientific literature exists on the positive and negative impacts of farming [8] or livestock farming [1, 5] in different territories with local or global impacts. However, the literature is not specific to dairy farming, nor does it detail an exhaustive list of the types of impacts associated with this type of production system. In this paper, services are defined as the positive impacts of the dairy sector on the three pillars of sustainability (economic, environmental, and social issues). Conversely, dysservices, with the spelling adopted in Tancoigne et al. (2014) where the dys prefix denotes something "to fail" like in dysfunctioning or "bad", are defined as the negative impact of the dairy sector on these three pillars of sustainability. In some circumstances, with dedicated actions, dysfunctional services can be reduced or corrected and transformed into services (impacts on the landscape, for example).

Funded by the EU Interreg Atlantic Area Program, the *Dairy-4-Future project* aims to increase the competitiveness, *sustainability,* and resilience of dairy farms in the Atlantic area. The Dairy-4-Future project involves five countries (Ireland, the United Kingdom, France, Spain, and Portugal) and covers, from Scotland to the Azores, 12 Atlantic regions that together represent 20% of EU-28 milk production and 100,000 farmers working in a wide diversity of milk production systems.

The analysis of services and dysservices across these regions allows for the generation of key information that is vital for decision-making processes and can provide a focus for targeted actions and public policies that can improve dairy farming's sustainability. The aim of this paper is to identify services and dysservices deriving from the dairy sector in regions of the Atlantic area of the EU, identified through the Dairy-4-Future project, using a bottom-up approach to gather perceptions and opinions of local actors linked to this sector.

## 2. Materials and Methods

Focus groups (FG) are open-ended, indirect, qualitative research techniques used to address different aspects of a subject in detail [9]. FGs are based on group discussions, which may or may not be statistically representative but which do include representatives from different social groups involved in or affected by the issue under discussion. The purpose of these groups is to generate discussion and prompt responses that cover both shared and conflicting ideological views.

The identification of services and dysservices linked to dairy farming involved 10 regions (the south-west of Scotland, Northern Ireland, Republic of Ireland, Cornwall, the west of Normandy, the south-east of Brittany, the Basque Country in Spain, Galicia, North Portugal, and the Azores). Nine focus groups were organized between April and November 2019, with 14 (between 9 and 23) stakeholders (e.g., farming actors, dairy processors, advisors and researchers, NGO, local authority representatives), with 3.33 farmers on average, and a specific survey took place in Scotland (150 answers, with 90 from farmers).

The list of identified services and dysservices and their ranking were strongly related to the natural and socio-economic characteristics of the individual territory. Therefore, the very diverse set of regional case studies, from the Azores to Scotland, allowed a range of services and dysservices to be identified.

During the focus groups, a SWOT (strengths, weaknesses, opportunities, and threats) analysis which asked «How do we improve the sustainability of the dairy sector in the territory?» was used to identify factors that were noted to be helpful or harmful in achieving this objective (improved sustainability). Following this, the different impacts (services and dysservices) proposed by the stakeholders were organized and ranked by category: provisioning (e.g., food), rural vitality, environmental quality, cultural heritage, and quality of life. Transversal analysis was carried out to group similar items proposed by different regions and rank these items by their category. Identification of several types of bundles of services/dysservices was then achieved with Bertin's matrix analysis, performed from a matrix (area x formatted items).

## 3. Results

The results of the SWOT analyses which investigated improving dairying sustainability in the regions provided an interesting ranking of issues associated with dairy farming presently. Classically, factors with external origin from the system (attributes of the "environment") were distinguished (diagram in Figure 1 from [3]). Here are the factors quoted 4 times or more (Figure 1). About the economic aspects and the demand, the growing demand for dairy products is the main helpful factor (6 citations) but we can notice that the food trends (9) were the main harmful factor before the poor connection between consumers and farmers about food (5) and the market power of retailers (4). About resources and natural environment, the favourable edaphoclimatic conditions for grass/forage/milk production were in first position (9) before the remarkable ecosystems & landscape (5). And for the harmful factors: competition for land and availability (8) and land fragmentation (4). Climate change for only 3 areas. About public policies, administrative burden caused by regulations (6, harmful) came before public support to dairy farming (4). Brexit is a threat for 4 areas.



## SWOT ANALYSIS

| External Origin (attributes of the "environment") | | | | |
|---|---|---|---|---|
| **Helpful to achieving the objective** | | | **Harmful to achieving the objective** | |
| **Demand** | Growing demand for dairy products | 6 | Food trends | 9 |
| | | | Market power of retailers | 4 |
| | | | Poor connection consumers/food/farmers | 5 |
| | Increasing consumer's awareness ("One Health") | 2 | Expectations consumer <> citizen | 2 |
| | | | AgriBashing | 2 |
| | | | Unfair competition/Free trade agreement | 2 |
| **Climate Land** | Favourable edaphoclimatic conditions for | 9 | Climate change | 3 |
| | Low landprice | 3 | Competition for land/availability | 8 |
| | (potential) Reparceling | 1 | Land fragmentation | 4 |
| | | | Infrastucture/logistics | 2 |
| | | | Lack of land tenure security | 1 |
| **Natur. Env.** | Remarkable Ecosystems & landscape | 5 | Water & env quality | 3 |
| | (Rural) tourism | 3 | Avail. Raw mat.(water, energy,...) and jobs | 3 |
| **Public Pol.** | Public Support to (dairy) farming | 4 | Regulations/business and admin. burden | 6 |
| | | | Political instability/lack of political clout | 4 |
| | no-deal Brexit | 1 | Brexit | 4 |
| | Low interest rate | 1 | Currency (£) | 1 |
| | | 10 | | 17 |

| Internal Origin (attributes of the "organization") | | | | | |
|---|---|---|---|---|---|
| **Helpful to achieving the objective** | | | **Harmful to achieving the objective** | | |
| **Supply Chain** | Traditionnal milk field/dairy cluster | 7 | | | |
| | Dairy processing (coop) | 8 | Dairy processing (adaptability/objectives/sect.organ | | 6 |
| | Specific/differenciated dairy products | 7 | Reliance on commod.exporting/price taker | | 4 |
| | Public recognizing of the territorial brand/specificity | 5 | Poor marketing/Low Added Value | | 3 |
| | Dairy sector in expansion | 3 | | | |
| | | | | | |
| **Family Farming** | Resilence of family dairy farming | 6 | Farm business/management skills (requirements up) | | 8 |
| | | | Volatility/Unprofitability | | 5 |
| | | | Increasing Cost of milk production | | 3 |
| | | | High cost for Investment | | 3 |
| | Faith to technical progress/Appetite for innovation | 6 | Work-life balance and isolation | | 4 |
| | Collaborative farming, automation, ICT, outsourcing to ove | 5 | Attractiveness | | 4 |
| **Milk Production** | Diversity Dairy systems maximising milk from grass/forage | 4 | | | |
| | Grass based | 3 | Reliance on grain feed/concentrates | | 4 |
| | High standards for milk production | 4 | Antibiotics over use, animal disease | | 4 |
| | Circular economy & Emerging Ren.Energy | 4 | | | |
| | Big data sharing/valorization | 3 | | | |
| | | | | | |
| | | | | | |
| | 13 | | | 11 | |

**Figure 1. SWOT analysis have been carried out for each case study to identify factors helpful/harmful to achieving the objective "How to improve the sustainability of the dairy sector in the territory"**

Regarding factors with internal origin (attributes of the "organization"), many helpful factors of the supply chain are identified: the existence of traditional milk fields and dairy clusters (7), of specific and differentiated dairy products (7), and of public recognition of the territorial brand/specificity (5). The evaluation of the dairy processing industry is balanced. Its strong presence, especially with cooperatives, is a helpful factor (8). But its poor adaptability and sectorial organization is worrying (6), as well as its position of price taker, reliance on commodities exporting (4). The resilience of family dairy farming (6) and the faith in technical progress/appetite for innovation (6), are helpful, as well as the possibilities of collaborative farming, automation, ICT, and outsourcing to overcome labour shortages (5). The increasing requirements for farm business/management skills (8), the economic volatility and unprofitability of dairy farming (5) are harmful as well as the work-life balance and isolation (4) and lack of attractiveness of dairy farming (4). About technical aspects, the diversity of dairy systems maximizing milk from grass/forage (4), high standards for milk production (4), circular economy & emerging Renewable energy (4) are helpful and for some areas the reliance on grain feed/concentrates as (4) and antibiotics over use/ animal disease (4) are harmful.

During the focus group, stakeholders identified 300 items of services and dysservices, with a quite balanced distribution between categories of functions and positive or negative impacts (Table 1). A strong function of supply provides a lot of provisioning services and was also mentioned as the basis for other functions, specifically the vitality of rural areas, as dairy farming is seen as a socially inclusive activity, and the production of public goods. The use and valuation of grassland by grass-based dairy farming systems were clearly associated with positive impacts and services provided for the four categories.

**Table 1. Repartition of positive and negative impacts of dairy farming to territories**

| Functions | Services (nb items) | Services | Dysservices (nb items) | Dysservices & Challenges | Total (nb items) |
|---|---|---|---|---|---|
| Provisioning | 55 | Strong function of supplying milk and meat; With high standards of production; Efficiency thanks to technical progress; Low(er) impact thanks to circularity/ autonomy, Grass/pasture, Manure; Differentiated products for domestic (food security, nutrition), biotech and exports. | 33 | Oversupply of milk and manure; Economic uncertainty and lack in processing, marketing, competition, organisation in the supply chain (= missing market opportunities); Impacts of the dairy expansion/intensification on Environment and Animal Welfare; Technical impasses (antibiotics), lack of circularity (imported feed), issues with Holstein male calves. | 88 |

| | | | | |
|---|---|---|---|---|
| Participating to Rural Vitality | 41 | Provides jobs on farms, supply chain & services, rural territories'<br><br>Generating «landscape economy» with access to (anthropized) nature;<br><br>Providing activities (social inclusive, labour intensive industry), life, communication, identity, skills, income in remote areas. | 32 | Attractiveness at stake (profitability, work pressure, paperwork). Both for paid and unpaid labour;<br><br>Labour shortage (paid), skills requirement (unpaid);<br><br>Interrogation about automation effects;<br><br>Traffic of heavy machinery;<br><br>Less cooperation between farmers, competition for land, misunderstanding with public. | 73 |
| Managing the Environmental Quality | 43 | Quality and efficiency of the resource management is favourable to biodiversity, carbon footprint, landscape, soil fertility;<br><br>Closing nutrients cycles and producing renewable energy;<br><br>Valorisation non_arable, disadvantaged land<br><br>Fire prevention. | 43 | Negative impacts of intensification/dairy expansion, on: water pollution, NH4 and GHG emissions, loss of biodiversity, soil management, antibiotic use and animal health/welfare, energy or water use, plastic waste;<br><br>Misunderstanding/nuisance for inhabitants (odors, flies, rodents);<br><br>Delocalized impacts of imported inputs. | 86 |
| Preserving Cultural Heritage and Quality of Life | 26 | Cultural/social capital maintenance;<br><br>Wellbeing of vibrant rural communities, rural solidarity, mental health;<br><br>Agriculture shows provide recreation and communication;<br><br>Traditional way of life;<br><br>Territorial identity and image (grassland; dairy products; breed). | 27 | Negative impacts of intensification/dairy expansion: «efficiency treadmill», financial problems, feeling of not being valued, social/technical requirements competition between farmers ->mental health (issues), isolation, burn-out;<br><br>Difficulties with consumers/citizen disconnected from food origin;<br><br>Nuisance for neighbours;<br><br>Lack of public access to landscape;<br><br>Lack of specific products, unfair marketing, loss of territorial cultural identity. | 53 |
| **Total** | 165 | | 135 | | 300 |

Services and dysservices should not be considered only separately. Combinations of services and dysservices at a local scale reveals synergies, trade-offs and interactions. Identification of several types of groupings of services/dysservices (Figure 2 [10]) has been achieved with a Bertin's matrix analysisisperformed with bertinplot() adapted from [6] in the R-package seriation. This analysis revealed proximities or correlations between items and/or territories, for example Northern Ireland and Cornwall; Southern Ireland and Normandy; Galicia and Brittany. It is likely that farming system type e.g., reliance on grasslands links some of these items.
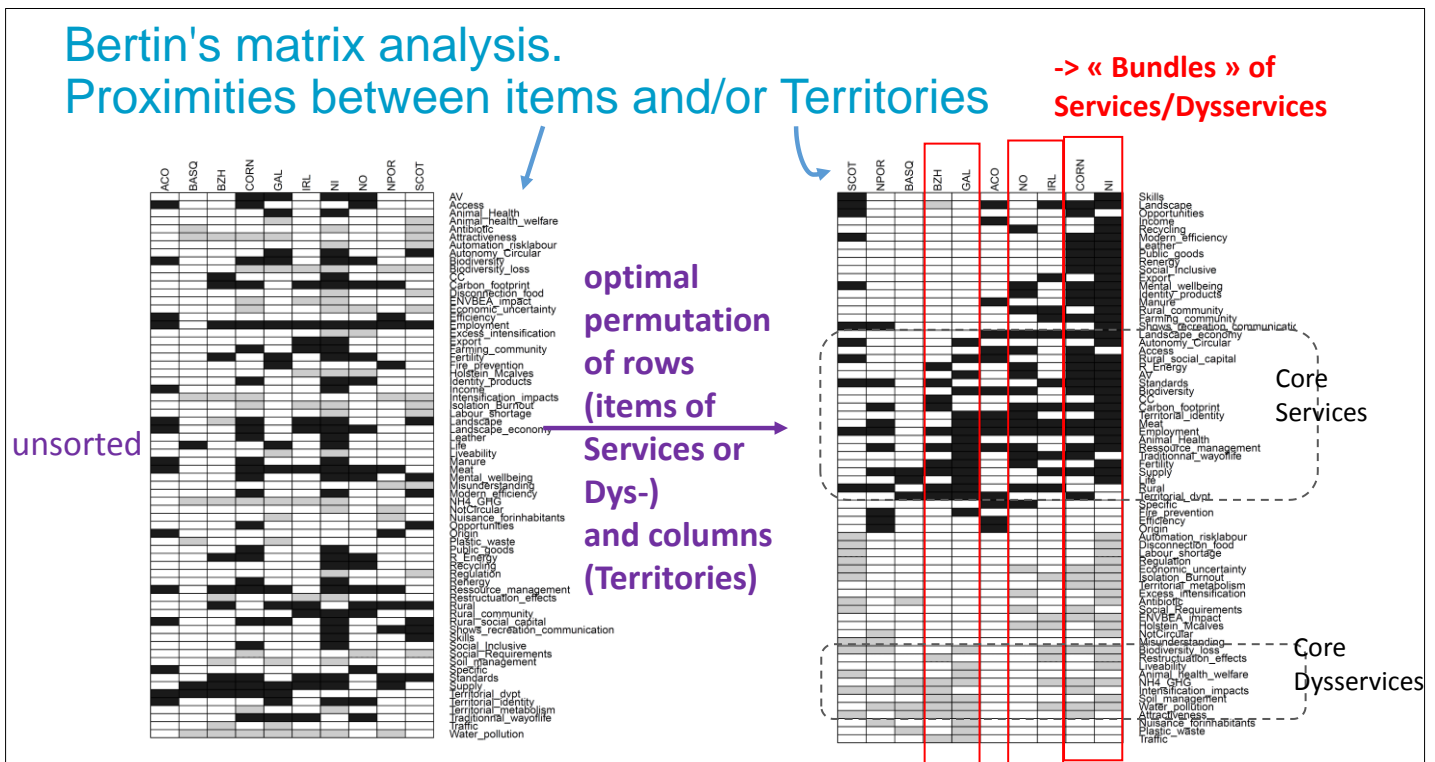


**Figure 2. Bertin's matrix analysis**

## 4. Discussion and Conclusion

Qualitative identification of services and dysservices in each case study region was realized in each case study thanks to focus groups with a range of stakeholders. However, there was a lack of consensus noted on some factors, particularly dysservices, where perception varied vastly dependent on area and individual stakeholder. Categorization of the items identified revealed crossover between the impacts (positive or negative) considered as services/dysservices, the challenges (this term was preferred to dysservices in some case studies in native English-speaking countries) and the strengths and weaknesses of the SWOT analysis.

Multifactorial analysis used to combine the results in into contrasting groupings of services/dysservices showed promising results which should be explored further [11]. However, the requirement to perfectly identify these groupings is quite high, especially in terms of homogeneity of reporting from each case study. The poor performance on this last point of the method of qualitative identification of services and dysservices using focus groups had already been noted on a set of more heterogeneous case studies [12].

This Dairy-4-Future project work has shown that milk production, a land-based production with many region-specific variations, has region specific positive and negative impacts. At the end of the focus groups, stakeholders were invited to suggest actions which could improve or support services and improve or remove dysservices. These actions relate to work (work pressure, skills), herd management, communication and response to consumer expectations, social acceptability of livestock systems, microeconomic solutions to get more resilient dairy farming systems and management of resources to get a more circular dairy economy.

## 5. Declarations

### 5.1. Author Contributions

Conceptualization, C.P.; methodology, C.P.; surveys and data acquisition, all authors; software and formal analysis, C.P.; validation, all authors.; writing—original draft preparation, C.P.; writing—review and editing, C.P., H.J.F., P.M., and M.J.G. All authors have read and agreed to the published version of the manuscript.

### 5.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

### 5.3. Funding

### 5.4. Institutional Review Board Statement

Not applicable.

### 5.5. Informed Consent Statement

Not applicable.

### 5.6. Declaration of Competing Interest

The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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