

EuroDairy

Practical measures to protect or enhance biodiversity



This project has received funding from the European Union's Horizon 2020 research and innovation programme (ISIB-2015-1 programme) under grant agreement No 696364

EuroDairy Report

Practical measures to protect or enhance biodiversity

Submission date:

28 January 2019

Names of the responsible authors and organisations:

Jennifer Huet and Ronan Lasbleiz (CNIEL)

Dissemination level

Open

Project deliverable

D4.5 Report and recommendations on practical measures to protect or enhance biodiversity

About EuroDairy

EuroDairy spans 14 countries, from Ireland to Poland, and from Sweden to Italy, encompassing 40% of dairy farmers, 45% of cows and 60% of European milk output. EuroDairy is an international network to increase the economic, social and environmental sustainability of dairy farming in Europe. EuroDairy fosters the development and dissemination of practice-based innovation in dairy farming, targeting key sustainability issues: socio economic resilience, resource efficiency, animal care, and the integration of milk production with biodiversity objectives. EuroDairy is funded by the EU Horizon 2020 research and innovation programme under Grant Agreement No 696364.

Contents

- 1.0 Executive summary4
- 2.0 Introduction.....5
- 3.0 Ordinary Biodiversity.....5
- 4.0 Biodiversity assessment on EuroDairy pilot farms.....6
 - 4.1 A common tool used to assess the EuroDairy farms6
 - 4.2 Results.....7
 - 4.2.1 Quantitative results – positive biodiversity status on EuroDairy farms7
 - 4.2.2. Qualitative results- A large range of practices, context and drivers.....15
- 5.0 Multi-actor feedback on biodiversity17
- 6.0 Recommendations for R&D.....17
 - 6.1 Metrics17
 - 6.2 Implementation18
- 7.0 Recommendations for policy18
 - 7.1 Farmers18
 - 7.2 AKIS19
 - 7.3 Policy makers19
 - 7. 4 Processors20
- Annexe 1 – Case studies21
 - France21
 - Italy23
 - The Netherlands25
 - England28
 - Northern Ireland:30
 - Portugal:31
 - Slovenia:.....33
 - Finland35

1.0 Executive summary

Biodiversity status of European dairy farms is not easy to measure. As a result, the majority of sustainability assessments tend to ignore biodiversity aspects, which can eventually lead to poor decisions and trade-offs by stakeholders. The EuroDairy work package on biodiversity was designed to improve knowledge and understanding of the issue, and to identify current practices at the European dairy farm level, challenges and opportunities, at the European dairy farm level.

The project set out to survey 40 farms (one third of EuroDairy Pilot farms). In the end, biodiversity assessments have been conducted, using a common tool, on 52 dairy farms in 10 different countries, which gives a robust overview of the variety of local contexts, drivers, practices and constraints. Forty four farms were surveyed initially, and the data statistically analysed. A further eight farms were subsequently surveyed, in Finland, to get a better understanding of the applicability of the tool to a completely different and unique set of circumstances.

The analysis of the results of these biodiversity assessments demonstrates that the majority of the EuroDairy farms have a positive impact on biodiversity, and could even contribute further, as there is still room for improvement:

- Half of the farms improve the landscape mosaic of the wider landscape
- 72% of the farms have enough semi-natural habitats on the farm area, to maintain or improve biodiversity
- For farms with permanent grassland, 68% of the permanent grasslands provide a high or an intermediate quality of habitats for flora and fauna.

However, the results also demonstrate high variability, due to the local situation and farm practices, sometimes opposing drivers, which confirms the complexity of management for biodiversity that needs to be managed locally. This complex picture suggests that European dairy farms hold important biodiversity potential that should be better catalogued, valued and improved.

Two workshops were organised to gather knowledge and exchange innovative ideas from the farm level. The conclusions and recommendations that emerged from the discussion suggest that to progress there is a need:

- To develop robust biodiversity metrics deploying, where appropriate, new measurement technologies
- To change mind-sets and raise awareness amongst dairy farmers about the importance and benefits of biodiversity
- To incorporate advice on biodiversity into advisory services
- To find combinations of drivers and incentives via the market or Common Agricultural Policy which increases the financial viability of positive biodiversity management
- To change the mind set also of advisors to convey the message that profitability, and promotion of biodiversity are not necessarily mutually exclusive, and
- To develop innovative collective projects at the local level.

2.0 Introduction

The dairy sector utilises the largest quantity of land within the EU (over 50 million hectares). Maintaining a good level of biodiversity on this land is extremely important for biodiversity at the European level. One of the main challenges to sustainable intensification of dairy activity is to balance productivity with maintenance and, indeed, enhancement of farm level biodiversity. Within participating countries and regions, there exists a wide range of landscapes, production systems (including high nature value grassland) and localised environmental drivers. This provides the opportunity to study how biodiversity can be maintained and improved in different contexts, through specific management interventions or by balancing the environmental goods and services required on a whole farm basis e.g. through 'land sharing' or 'land sparing' for biodiversity. EuroDairy aims to identify current practices and new opportunities to maintain or enhance biodiversity. The ability to develop and demonstrate 'biodiversity-friendly' dairy systems will be essential to retraining consumer confidence, addressing some societal concerns about the sector and a range of environmental issues.

The work presented here, in identifying current practices and opportunities within the EuroDairy Work Package on Biodiversity fits into the overall objective to support economic, social and environmental sustainability of European dairy farming.

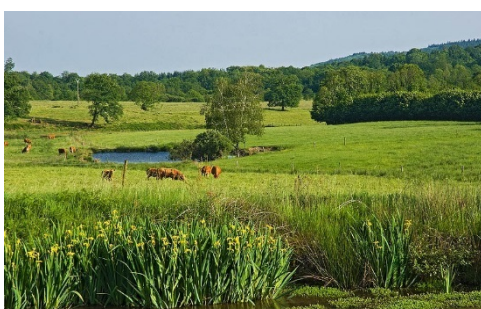
3.0 Ordinary Biodiversity

Biodiversity can be defined as the number, the diversity and the variability of living organisms, particularly how they evolve in time.

Biodiversity as an issue is often discussed through the prism of « remarkable biodiversity », especially as it relates to groups of endangered species. It also includes the different policies enforced to protect these species. However, so called 'ordinary biodiversity' is equally important, not because of its scarcity but thanks to its role in supporting ecosystems and their interactions. This concept includes all insects, flora, fauna, but also soil microorganisms. Together, these elements have a fundamental role to play in the ecological regulation of agro-natural areas. Therefore, these species and their interactions have a major impact on agricultural production with pollination and soil fertility. These different ecosystem services are the assets of sustainable dairy farms.

Dairy farms can contribute to landscape heterogeneity. The components of these landscapes will play different functions for many species (habitat, breeding grounds, food, hibernation sites...). Landscape is often closely related to the main production system of a specific area. In crops production areas, landscape homogeneity dominates at the expense of biodiversity as hedges and groves have disappeared as larger areas of cropped monoculture have developed. In a dairy farming landscape, these agro ecological elements are often preserved due, for example, to the presence of permanent grassland that maintains and supports biodiversity.

Dairy farming landscape



Monoculture landscape



Management of hedges, grassland and slopes will provide shelter to bumblebees, which can play their part in pollination. It is also in the grassland area that the most important populations of earthworms are found, favouring soil fertility. Bats play a major role in insect regulation on grassland, particularly where and abundance of prey is supported by the presence of organic matter on the pasture. A diversified soil mosaic (grassland, crops, hedges...) provides varied habitats for different species of bird, that also help to regulate insects, reptiles and rodent populations. These examples, among others, reveal the vitality of the interactions between dairy farms and ordinary biodiversity. Management practices can favour the development of species, which could contribute to solving practical problems, for example, around soil fertility or pest control.

4.0 Biodiversity assessment on EuroDairy pilot farms

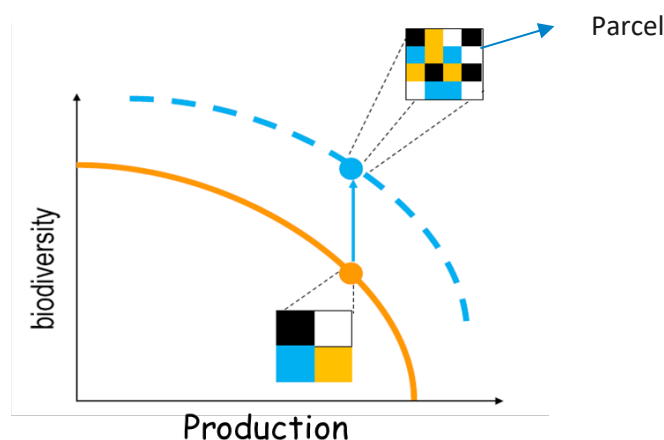
Approaches to biodiversity vary by region, local biodiversity priorities, and policy instruments for environmental protection. The project consulted widely to identify and capture the management practices being implemented by farmers to maintain biodiversity on their farm. These practices were collected from Pilot Farms to gain a better understanding of the problems and opportunities related to maintaining or improving biodiversity. The following sections provide a synthesis of the different innovative practices that are being used to support biodiversity on dairy farms, with respect to their specific context, challenges and opportunities. Specific case studies can be found in Annex 1.

4.1 A common tool used to assess the EuroDairy farms

The Biotex tool¹ was used as the reference methodology for this biodiversity assessment, but was adapted to the project needs. It was developed by the French Livestock Institute (Institut de l'élevage), with the support of the French Dairy Interbranch Association (CNIEL), French Meat Interbranch Association (INTERBEV) and the French Department of Agriculture and Food.

The first step of the tool is the description of the landscape mosaic. The key concept is that a diversity of land use is favourable to species resilience. Indeed, a heterogeneous landscape mosaic would limit the impact of intensive agricultural practices for the fauna species within a plot. This analysis depends on two scales: the regional scale and the farm scale. The main indicator used in this step is land use through diversity in cropping.

Evaluation of the landscape mosaic diversity

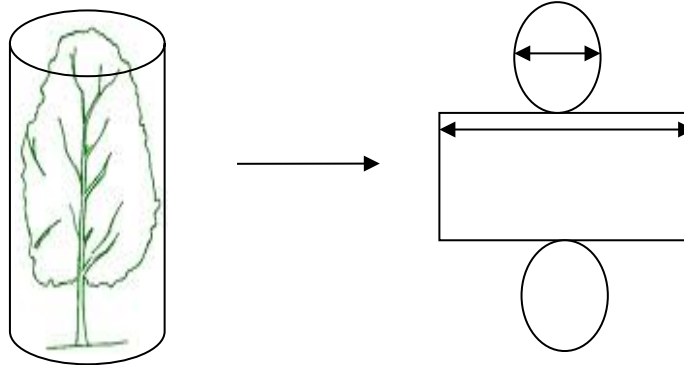


Source : Muriel Tichit - INRA, 2011

¹ Manneville V., Chanséaume A. et Amiaux B., « BIOTEX : une démarche d'évaluation multicritère de la biodiversité ordinaire dans les systèmes d'exploitation d'élevage et de polyculture-élevage », IDELE, 2014

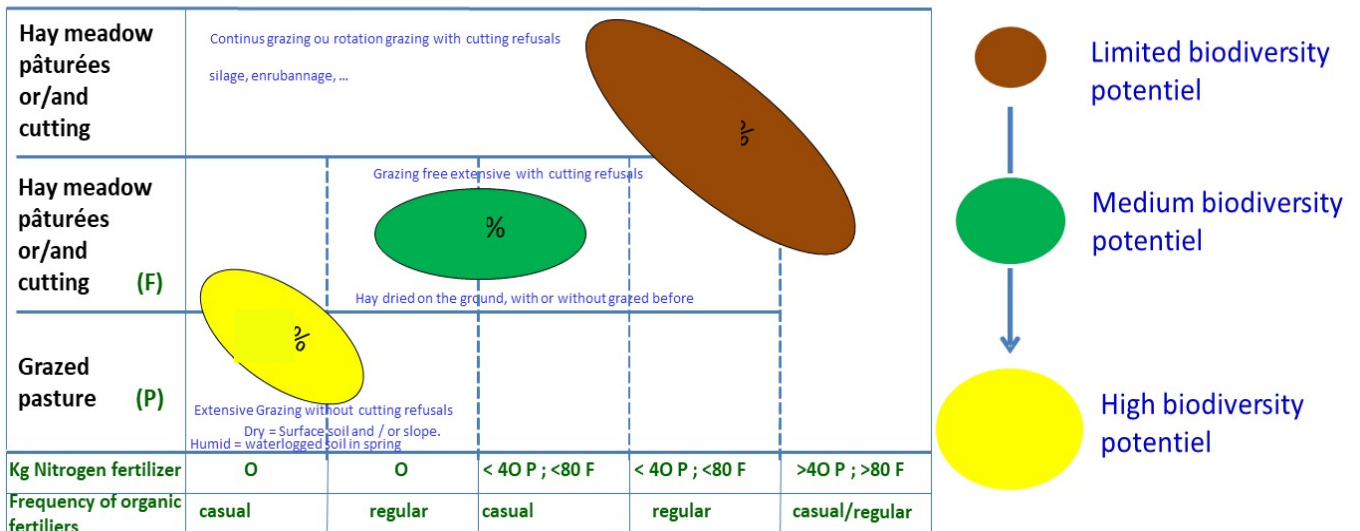
The second step is the quantification of semi-natural habitats. The scale here is the farm scale. To have an indicator of the capacity of the farm to provide habitats and food for different species, the tool catalogues all the agro-ecological infrastructures present, and converts them into a developed biodiversity surface by hectare. However, the tool also considers the volume of habitat available. For example, with a hedge or a tree, it considers the surface on the soil, as well as the volume based on its height.

Example of the Developed biodiversity surface calculation



The third step examines the management practices on permanent grassland that play an important role in ecological and climate regulation. Permanent grassland plays an important role in recolonizing impoverished ecosystems, like annual crop plots. At the plot scale, the tool focuses on grazing and fertilization practices, and their intensity, as the magnitude of positive impacts of grassland depends on these factors.

Evaluation of the impact of grazing and fertilization practices on biodiversity



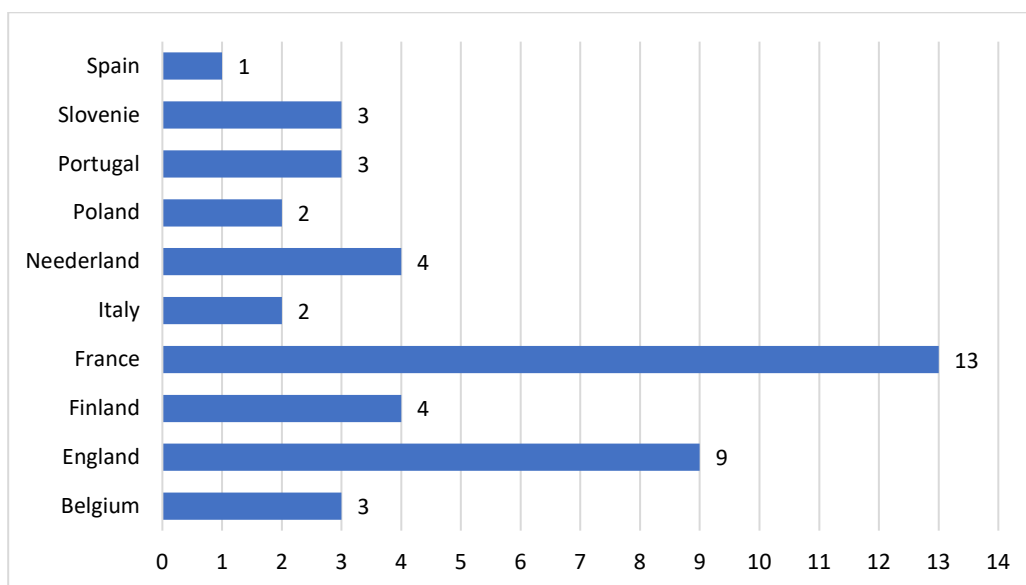
4.2 Results

4.2.1 Quantitative results – positive biodiversity status on EuroDairy farms

The Biotex tool was used to conduct biodiversity assessments on a total of 52 farms in 10 different countries: 13 in France, 9 in England, 12 in Finland, 4 in the Netherlands, 3 in Belgium, 2 in Italy, 2 in Poland, 3 in Portugal, 3 in Slovenia and 1 in Spain. Forty four BIOTEX surveys have been statistically

analysed. Eight supplementary surveys were also conducted, in Finland, after the statistical analysis was completed. Four countries represented 86% of surveys analysed.

Figure 1 : Survey number by country



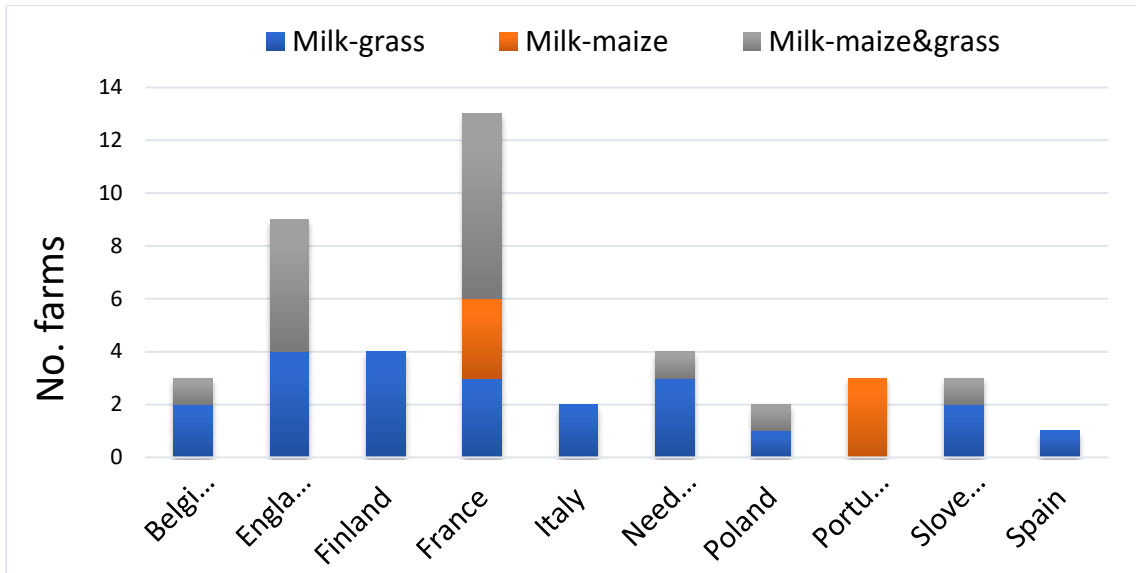
The surveyed farms sample (Table 1) reflects a diversity of European farm systems. However, this sample is not necessarily representative of the diversity within each country. Northern countries of Europe larger farmers were surveyed, whereas in Poland and Spain the tendency was towards smaller farms.

Table 1 : Characterization of farm sample

	Average Dairy cows number	SD Dairy cows number	Average TFA (ha)	SD TFA (ha)	Average crops (ha)	SD crops (ha)	Average forage (ha)	SD forage (ha)
Belgium	83	+/- 6	50	+/- 18	7	+/- 6	44	+/- 12
England	348	+/-178	227	+/- 144	32	+/- 50	195	+/- 103
Finland	110	+/- 54	260	+/- 225	44	+/- 36	217	+/- 191
France	83	+/- 24	118	+/- 45	24	+/- 17	94	+/- 44
Italy	152	+/- 17	106	+/- 8	14	+/- 20	92	+/- 11
Netherlands	160	+/- 51	128	+/- 44	3	+/- 4	125	+/- 42
Poland	16	+/- 0	23	+/- 4	+/- 0	+/- 0	23	+/- 4
Portugal	173	+/- 48	79	+/- 10	5	+/- 2	74	11
Slovenia	49	+/- 28	64	+/- 27	23	+/- 25	41	23
Spain	20	-	33	-	0	-	33	-

The typology case “Milk-grass” farms (Fig. 2) shows that 50% have fodder production based on grass (under 10% maize in the forage system). The ‘Milk-grass & maize” represents 14 % of the sample. Their main forage production is based on annual or perennial forage crops, with grassland less predominant (10 - 30% maize). At least, 36% are represented by “Milk-maize”, where the proportion of maize in the forage system is above 30%. This sample is not meant to be a statistically significant representation of agricultural systems in each country.

Figure 2 : Forage systems of farm sample



A neutral to favorable Mosaic effects of dairy farms

Landscape heterogeneity is currently derived from Shannon² diversity index and Pielou's evenness index, based on farmland cover. Each country has a neutral, or favorable, situation for the preservation of biodiversity (Table 2). In some cases, the diversity index seems unfavourable. However, most of the time that is because the dominant land use category is grassland (all farms with a score equal to 0 have only permanent grassland). The interpretation is then favourable, because grassland can provide a very high level of biodiversity. In some other cases, the tool was not able to capture adequately the specific nature of the landscape in some countries, like Finland. It has large areas of forests, which were not accounted for, and mixed species forage that were accounted for but only as one crop. In some other cases however, the dominant land use category was an annual crop like maize, which is not favourable to biodiversity. This situation could then be improved. Table 2 gives an overview of the biodiversity status of farms surveyed in different regions, and how different these farms are from the region in which they are situated. Clearly, the table does not allow comparison between countries, as each result is context dependent.

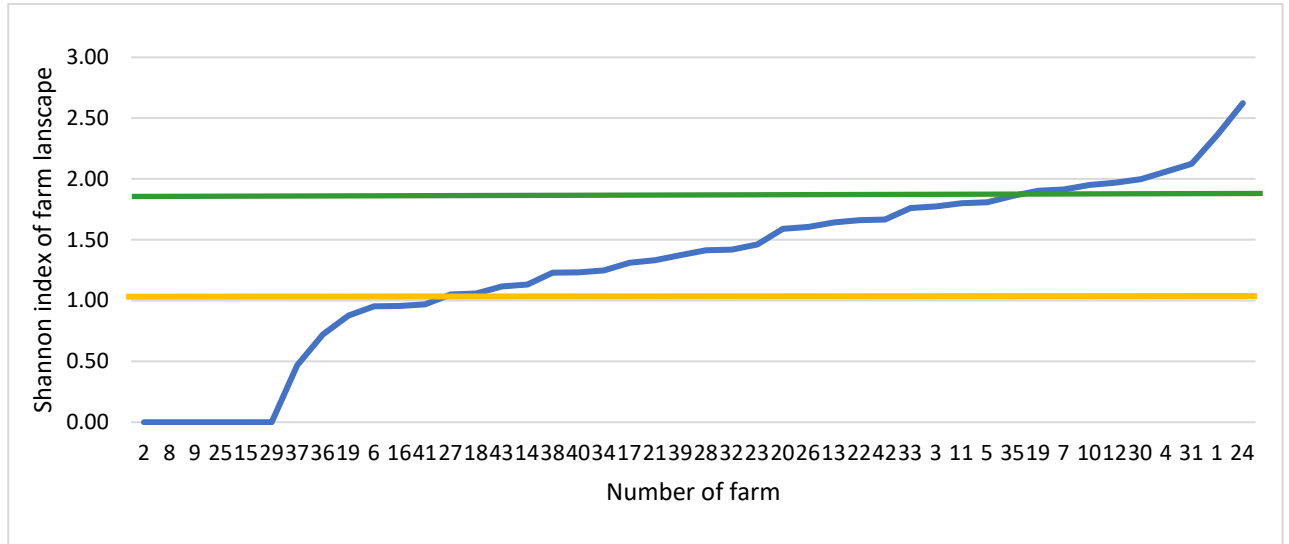
Table 2 : Variability Shannon index

	Average SHANNON of territory	SD SHANNON of territory	Average SHANNON of farm	SD SHANNON of farm
Belgium	2,19	+/- 0,00	1,80	+/- 0,16
England	1,40	+/- 0,35	1,16	+/- 0,93
Finland	1,45	+/- 0,18	1,05	+/- 0,19
France	1,66	+/- 0,45	1,61	+/- 0,66
Italy	0,57	+/- 0,81	0,57	+/- 0,80
Netherlands	1,73	+/- 0,54	1,62	+/- 0,23
Poland	0,60	+/- 0,18	0,60	+/- 0,18
Portugal	1,28	+/- 0,08	1,28	+/- 0,08
Slovenia	1,25	+/- 0,37	1,25	+/- 0,37
Spain	1,49	-	1,49	-

² Shannon index is a diversity index that quantifies crop diversity, Pielou index is an evenness index that highlights the presence of a dominant land use category. Shannon and Pielou's indices show the effects of farm and regional land use mosaic on biodiversity

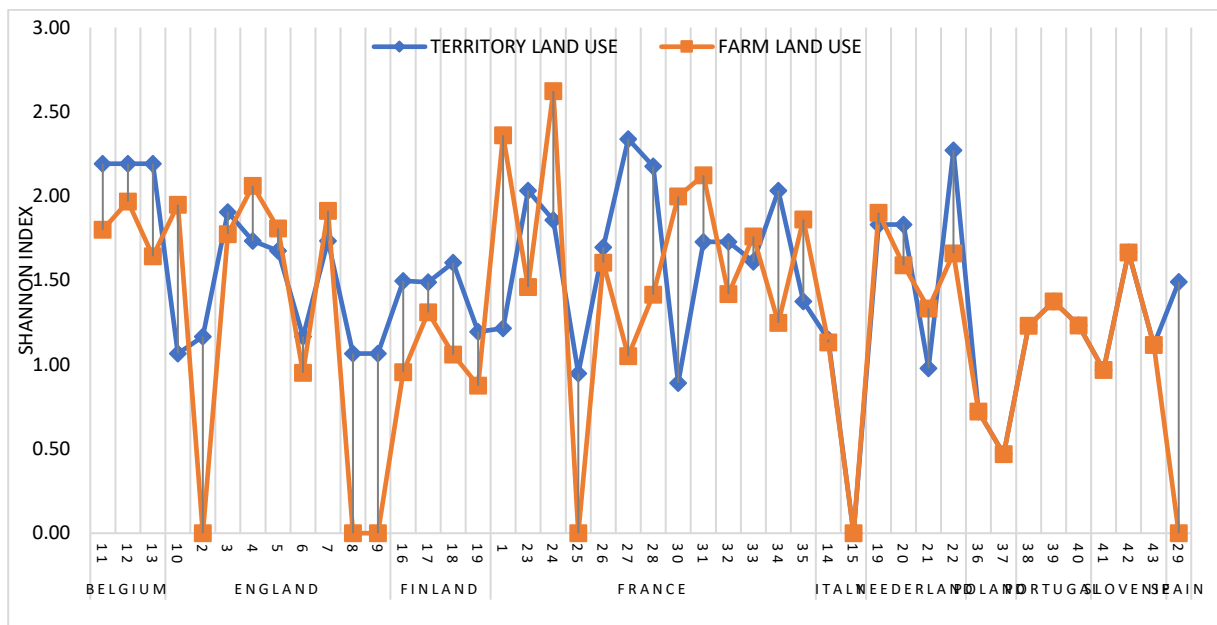
For the mosaic effect at the farm level, 63% of farms are in a neutral position. These have a real opportunity to develop diversity of cover; 26% have a good position (Figure 3). However, for the last 10%, if we consider the proportion of permanent grassland within the total farm area, their position is neutral.

Figure 3: Mosaic effect at farm landscape scale



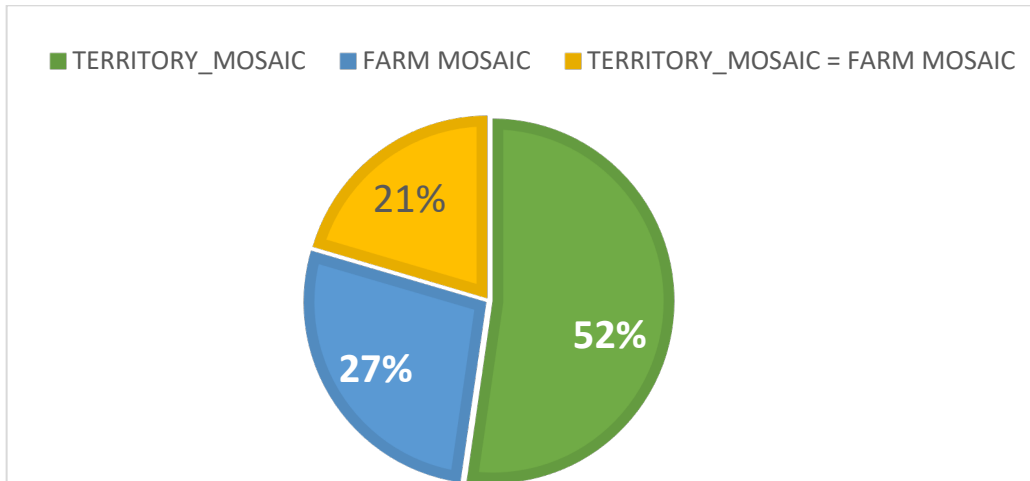
The diversity of cover on a dairy farm is often favorable for biodiversity, when the farmer tries to be as self-sufficient in feed as possible, introducing cereals and protein rich crops into the forage system. The best situation is also to preserve permanent grassland with this type of strategy.

Figure 4 : Mosaic effect between territory land use and farmland use



An analysis of the contribution to the territory mosaic points out that 27 % of farms (Figure 5) have a more diverse cover than the surrounding region. However, 52% of regions have a mosaic effect higher than the landscape mosaic of the farm. In 21% of cases, the mosaic effects are equal, between region and landscape of farm.

Figure 5 : Contribution to mosaic effect



I am a dairy farmer, what should I do?

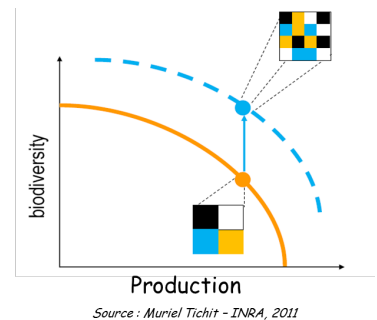
Use of agricultural land: landscape mosaic to promote species resilience.

Diversity of land use brings resilience to the faunistic species in the annually cultivated areas. The effects of very aggressive farming practices on resident fauna species are limited, when the mosaic is diversified.

OBJECTIVE FOR THE FARMER: Improve farm's contribution to the landscape mosaic

PROPOSED RECOMMENDATIONS :

- Have a global approach of vegetation cover of the farm, to increase diversity
- Consider the size of fields or individual cropped areas
- Work with other farmers and landowners to improve the heterogeneity of landscape mosaic on a larger scale



A favorable Developed Surface of Biodiversity

The concept of Developed Surface of Biodiversity is assessed by drawing from the inventory of Agro ecological structures (AES) distributed across the total farm area. This inventory captures the diversity of habitats, and indirectly, the diversity of species potential. Using this indicator, situations scoring under 0,5 BDA/UAA are too limited in the availability of habitat (Table 3).

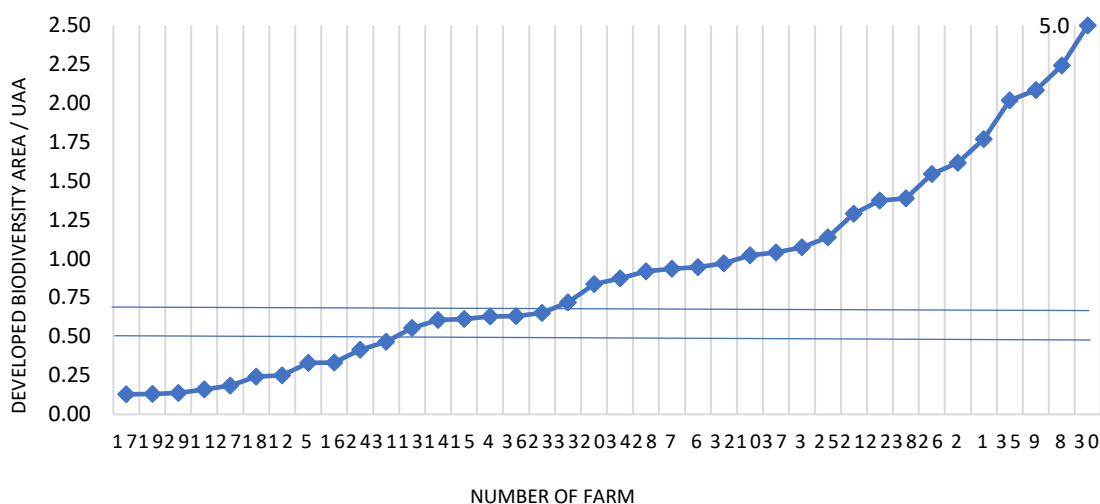
Table 3 : Variability of DBA per UAA

Total	Average developed biodiversity area / UAA	SD Developed biodiversity area / UAA2
Belgium	0,32	+/- 0,21
England	1.21	+/- 0,64
Finland	0,21	+/- 0,10
France	0.91	+/- 0,58
Italy	0.61	+/- 0,00
Netherlands	1.04	+/- 0,35
Poland	1.21	+/- 0,25
Portugal	0,14	+/- 0,00
Slovenia	0.81	+/- 0,26
Spain	5,30	-

The range (Table 4) is between 0.25 to 5.3 BDA per UAA. For example, for the farm number 2 (Figure 6), this indicator means that for 1 ha of UAA, the farm preserves 1,62 ha of habitats for biodiversity.

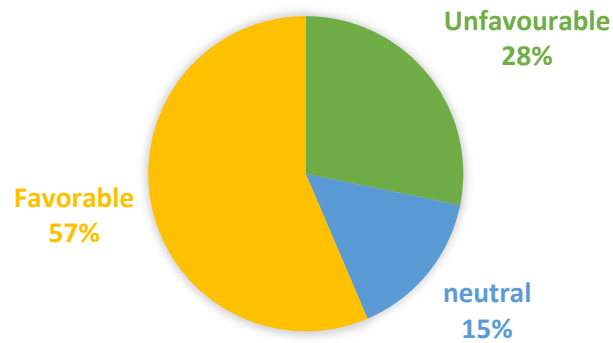
AES are essential factors for biodiversity because they are clearly a source of habitats and food for many species. Indeed, species richness of vascular plants, birds and arthropods increases with the area of AES in European landscapes.

Figure 6 : Heterogeneity and complexity induced by the UAA of farm in the landscape



From this graph, 28% of farms have not enough semi-natural habitats and food to preserve fauna and flora biodiversity (Figure 7). On the other hand, 15 % are neutral in capacity to preserve biodiversity. Finally, 57% of UAA farm preserve, and increase habitat for biodiversity.

Figure 8 : Contribution level to the heterogeneity of UAA farm



I am a dairy farmer, what should I do?

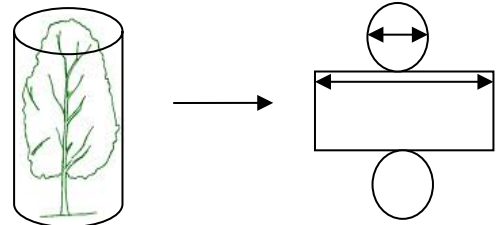
Landscape heterogeneity: the signature of the shelter capacity

The Developed Biodiversity Area (DBA)/ ha UAA reflects the landscape complexity present on the dairy farm, and corresponds to the capacity of the farm to host different fauna and flora species

OBJECTIVE FOR THE FARMER: Develop landscape heterogeneity

PROPOSED RECOMMENDATIONS :

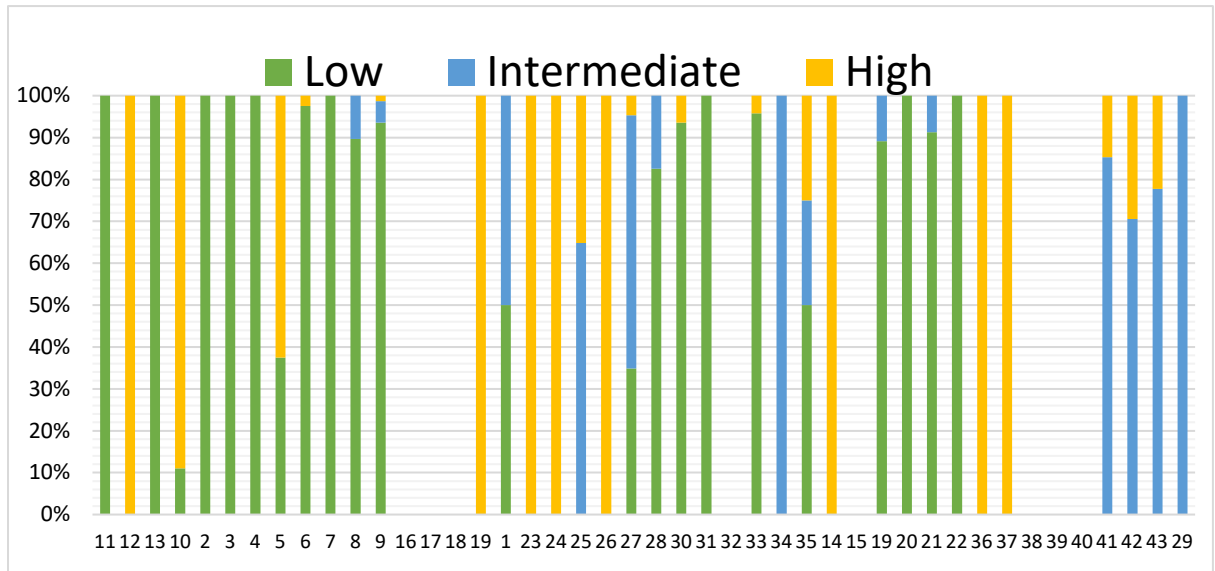
- Implement Module 2 of the BIOTEX tool to identify fragmented areas in the landscape, and work on inserting new AES to reconnect the AES together.
- Create functional hedges, used to shelter animals during hot or humid weather conditions
- Restore or create functional AES to limit wind erosion of soils, and create a local micro-climate to protect crops in winter from frost, and in summer from soil desiccation.
- After maintaining AES, it is important to plant new AES in a coherent manner to create or strengthen ecological corridors.



A high biodiversity potential in Permanent grassland

Permanent grassland management has an impact on biodiversity. Permanent grassland with low intensification provides many ecosystem services, as well as habitats for flora and fauna. The variability of permanent grassland management shows that many farms have high positive value for biodiversity (Farm n°22, 24, 26, 36 and 37). Another group has intermediate value (Farms 25, 34 and 35), while a final group confers much less benefit reflecting the management system.

Figure 9 : Variability of the Permanent grassland management

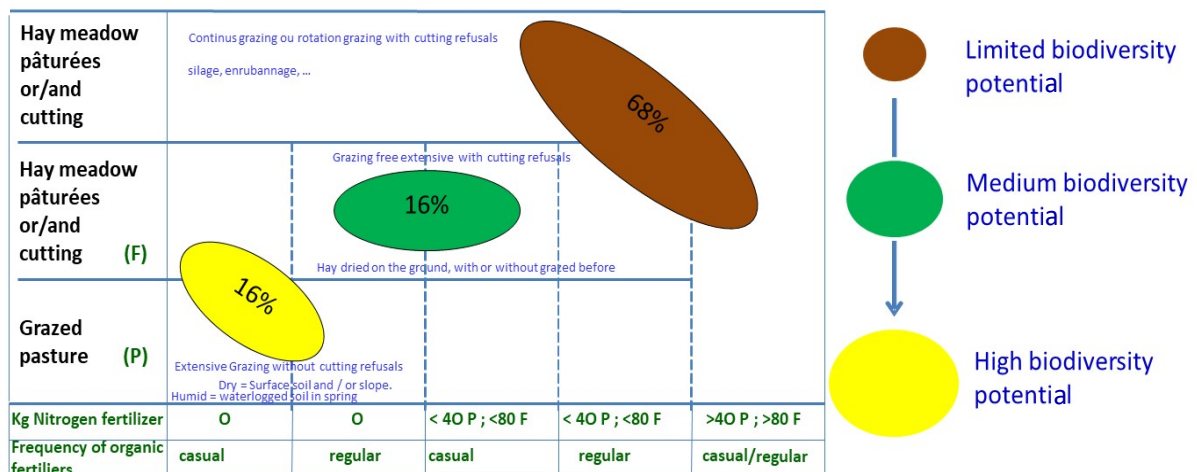


To take an overview, we aggregated the effect of different levels of management on permanent grassland, using information given by four countries, Netherlands, Poland, Spain and France.

From this perspective, 68% of permanent grassland provide a high or an intermediate quality of habitats for flora and fauna, while 32% provide low quality habitats (Figure 10).

However, this observation does not contradict the value of grass production for grassland biodiversity, and this is not the purpose behind the tool. Indeed, even if management and fertilization pressure limits flora and fauna diversity, good soil biological status can still result. Permanent grassland also provides important environmental services: water quality, carbon storage for climate regulation, and forage production for dairy and meat animals.

Figure 10 : European point of view about the place of permanent grassland



Temporary meadows are not included in this assessment, as their management is different from the permanent pastures. For the farms that have a majority of temporary meadows, it could be interesting then to use the global Biotex method to estimate implications for biodiversity.

I am a dairy farmer, what should I do?

Permanent grassland: a biodiversity resource, with conditions

Grassland has a stabilizing effect, if it is not intensively managed. It is a source of available biodiversity, and allows colonization of poorer areas, such as annually cultivated areas. There is dynamic exchange between grassland and other areas (woods, fields...).

OBJECTIVE FOR THE FARMER:
Manage permanent grassland to preserve its regulatory role

PROPOSED RECOMMENDATIONS :

- Restore floral diversity in hilly or mountainous areas, and build a grassland use mosaic
- Preserve wet meadow areas to regulate flood problems, in agricultural fields and urban areas
- Develop a rotation of permanent grassland harvesting practices, for grassland and permanent grassland production systems
- Guarantee, in a sustainable way, grass resources by favoring the floral diversity, hence preserving a unique meadow habitat for many food chains

Hay meadow pâturées or/and cutting	Continus grazing ou rotation grazing with cutting refusals silage, enrubannage, ...				
Hay meadow pâturées or/and cutting (F)	Grazing free extensive with cutting refusals Hay dried on the ground, with or without grazed before				
Grazed pasture (P)	Extensive Grazing without cutting refusals Dry = Surface soil and / or slope. Humid = waterlogged soil in spring.				
Kg Nitrogen fertilizer	0	0	< 40 P ; <80 F	< 40 P ; <80 F	>40 P ; >80 F
Frequency of organic fertilizers	casual	regular	casual	regular	casual/regular

4.2.2. Qualitative results- A large range of practices, context and drivers

Sustainable intensification – The examples of UK, Belgium, France, Ireland and The Netherlands

Dairy farms in this group have very efficient management systems for the main grazing and conservation platforms, aiming to produce as much feed possible on the land area available to the herd. To compensate, they can maintain a dedicated biodiversity area on some parts of the farm, through the designation of official or unofficial protected areas. The cases studies in Belgium, England, Netherlands, Northern Ireland, in Annexe 1 illustrate the options pursued by this group.

Current practices 1: These farms use their main fields intensively but preserve or create a specific area on the farm to maintain biodiversity (grassland on a protected Loch in Northern Ireland, traditional wet grassland in the Netherlands; wild bird area in England, wildlife corners in Belgium).

Current practices 2: The farmers maintain a dialogue and informal agreements with the local nature/wildlife association, to create and maintain biodiversity areas on the farm, adapted to local needs and priorities.

Constraint: The farmers need to spend ‘unproductive’ time to maintain the biodiversity areas and need a minimum level of knowledge about how to manage these areas in order to preserve biodiversity. Their efforts are often not known, or recognised. Forage from ‘nature’ field areas is low nutritional value.

Opportunity: with the new societal demand for more transparency and dialogue with farmers, this model could be one of the solutions to reconciling farmer's and society's priorities, while improving biodiversity.

Traditional sustainable dairy farming- The examples of Slovenia and Poland

The dairy farms in this group are very traditional with a small herd and small fragmented fields sometimes far removed from the central farm location. The small fields are surrounded by large hedges. Due to this landscape mosaic, the farmer is often unable to achieve efficient levels of production. The cases studies in Slovenia and Poland, in Annexe 1 illustrate this group.

Current practices 3: Maintenance by the dairy farmer of a mosaic of small fields with different crops and extensive permanent grassland (mixed-grass species), grazed or cut for hay, with hedges around them and small forests. This yields a sustainable and diverse landscape in the region.

Constraint: The dairy farms cannot reach a high level of productivity in this context, so they cannot be competitive. The obvious positive impact of these farms on the biodiversity of the region is not recognised nor valued. An additional complication is that forage from these fields is of low nutritional value.

Opportunity: Consumers expectations are changing and they increasingly desire sustainable products that are respectful of the environment. The increase in demand for products based on these points could be a market opportunity to help these farms differentiate their products and create additional value. Policy could help these farms, so that they do not make the economic choice to intensify.

*"Small fields and extensive pasture are good for biodiversity but not for business' Slovenian farmer
'Extensive pasture is good for flowers but not very good for milk production". – Polish farmer*

Mountain, forest and marginal areas dairy farms – The examples of France, Finland and Northern Ireland

Farms in this group have different challenges and practices than those in other areas studied, because they are surrounded by forest, or situated in difficult areas. In Finland, and mountain regions, the challenge is to keep open areas within the region to maintain biodiversity, and not to plant more hedges and trees. In areas like in the wet grassland in Northern Ireland, or in the fields on the slopes of mountains, grazing by dry stock is the only action possible to maintain biodiversity. The case studies in Annexe 1 illustrate this group.

Current practices 4: Maintenance of open areas next to forest, extensive grazing on marginal areas

Current practices 5 : Use of mixed crop forage and mixed grass species to improve the biodiversity level of fields, and in cow diets (see the Finland case study in Annexe 1)

Constraint: The vital role of the dairy farms in these difficult areas in maintaining biodiversity, is not recognised nor valued

Opportunities: there is an opportunity to communicate to the consumers about the vital and positive role of dairy farms in marginal areas and to create value. Policy could help and support dairy farms in these difficult areas to maintain activity. Policy measures, which are conflicting, should be avoided e.g. incentives to plant trees to the detriment of heterogeneity in the landscape.

Peri-urban areas dairy farming- The examples of Italy and France

The farms of this group are situated next to urban areas. The expansion of the city puts pressure on the biodiversity of the region. These farms play an important role of maintaining grassland and semi-natural habitats, on the periphery of built-up areas (see the case studies in Annexe 1)

Current practices 6 : Maintenance of semi-natural habitats and grassland next to urban areas

Constraint: The expansion of the city limits the potential of the farm

Opportunity: The farms have the opportunity to sell their products directly to the consumers, create a dialogue, and communicate on biodiversity.

Dairy farms in dry areas – The example of Portugal

Because of climate and tradition, cows do not go out to graze. A lot of bats and birds find shelter in the cow shed. These farms maintain stone walls, fruits trees and bushes around relatively small fields.

Current practices 7: Maintenance of fruit trees or small orchards, bushes and stone walls around small fields and cow sheds.

Constraint: Some measures to maintain biodiversity can conflict with fire prevention policy

Opportunity: Better inclusion of biodiversity maintenance in regional policy

These assessments give an overview of the high diversity of regional context, challenges, drivers and current practices associated with biodiversity on dairy farms at the European level. However, this diversity, should also be a motivator for maintenance of biodiversity at the European level.

'Biodiversity depends on 3 things : diversity, diversity and diversity' (Dutch Dairy farmer)

5.0 Multi-actor feedback on biodiversity

Two complementary workshops were organised in France and in Ireland to capture the current knowledge and ideas on the biodiversity issue. Questions addressed through the presentations and discussion were:

- why and how the biodiversity is a major topic for dairy farmers
- what are the practical links between a dairy farm and its biodiversity
- methods to improve the farmers knowledge about biodiversity on their region
- how to improve farming practices and develop collective initiatives for progress
- consider the risks and opportunities around the biodiversity issue
- how to measure biodiversity - meaningfully and cost effectively
- how to capture value – in circumstances where productive capacity and income may potentially be reduced
- what are the most appropriate interventions to improve biodiversity

Presentations and results from the discussions are summarised in the conclusion below. Reports from both workshops can be found on the EuroDairy website at www.eurodairy.eu .

6.0 Recommendations for R&D

6.1 Metrics

Well-developed standard metrics are available for GHGs and water use efficiency, but not yet for biodiversity. Assessing biodiversity directly can be problematic – which species or indicator to measure, a full on-the-ground audit is expensive and time consuming. For this reason, it is necessary to develop assessment methods and metrics that are comparable, robust, easy to use and credible.

The Biotex tool is an intermediate approach to addressing these challenges, assessing features on the farm which are known to have a positive impact on biodiversity, and drawing comparison with priorities for biodiversity in that locality.

However, consideration of biodiversity impacts beyond the farm gate are not taken into account. Adding impacts beyond the farm gate could significantly alter the wider biodiversity performance of different

production systems. Another limit is that a 'one size fits all' tool doesn't always work for biodiversity, as demonstrated by the Finnish farm assessments, which didn't account for specific northern climatic influences and farm circumstances.

Technology has the opportunity to offer future solutions, including assessment of biodiversity at a national scale. Aerial imagery is capable of distinguishing habitat with an accuracy of 96%, and in identifying the type of habitat with an accuracy of around 80%. Once sufficient data has been processed, and validated on the ground, machine learning can be used to automate the process and to increase the level of accuracy. This would enable the extent, type and quality of habitat to be calculated for parcels of land, specific farms, geographic areas, supply chains and at national levels.

Recommendations

- There is a need to start measuring; otherwise, biodiversity will always be ignored in sustainability assessment, leading to wrong decisions. Aerial mapping can provide a lot of useful quantitative and qualitative information.
- Continue to improve and expand tools and techniques that describe better the biodiversity impacts within, and beyond, the farm boundary. Development and refinement of remote measurement techniques to assess habitat presence and quality, adapted to the local context.
- Develop simple, comparable, metrics which can be applied at the farm level to describe baseline biodiversity potential, and to measure/direct future improvement

6.2 Implementation

Gaps in current knowledge on biodiversity and barriers to implementation were identified, which might be addressed by further research, such as:-

- Demonstration projects which demonstrate the integration of biodiversity objectives into profitable production
- Further use of the EIP model to co-create and test out local and regional projects, with a focus on biodiversity and which include farmers, scientists, the supply chain and policy makers. Biodiversity is a local issue that needs to be discussed and developed with local experts, in order to design the right action plans. Good examples of successful practical projects, which incorporate payments for action on biodiversity exist (e.g. BRIDE project).
- Projects to gather a better understanding of farmer attitudes to biodiversity, and from that knowledge exchange needs.
- More collective projects that bring together multiple stakeholders. Many practices that favour biodiversity need collective work and consequently more organisation at different scales, between farmers but also between farmers and municipalities, environmental and hunting associations, for example. The public actors have an important role to facilitate this collective work, and the main stakeholders on a territory should be easily identified.

7.0 Recommendations for policy

7.1 Farmers

Most farmers are not aware of their impact on biodiversity, positive or negative. There is scope to embed consideration for biodiversity across a greater number of farms and the main body of producers. Having the majority of farmers creating 1-2% habitat, could have greater impact than a smaller number with a relatively high proportion of land dedicated to biodiversity.

'biodiversity will increase more when all conventional farmers create 1% more space for biodiversity than when the top 'nature farmers' create 5% more space on their farm' (Dutch dairy farmer)

In some instances, biodiversity measures might entail very little additional cost. Therefore, a change in farm mind-set can yield very real benefits, to open up thinking by dairy farmers on the merits and opportunity of creating more space for biodiversity, and to embed this in their overall offer to consumers. Paying attention to valuing hedges and boundaries, as opposed to solely the productive part of field.

- Results from the biodiversity audits undertaken within the EuroDairy project, suggest that there is greater biodiversity potential present on many dairy farms that it is currently given credit for, but more could be done. Small measures can make a difference, particularly if magnified by widespread farmer participation.
- Local leadership, local action, peer-to-peer learning, and farmer testimony are powerful motivators and credibility builders.
- Farmers need information about how to measure, manage and communicate biodiversity on their farm

7.2 AKIS

Just as a change of mind-set, may be required for farmers, so too for their advisors. At present, where advice on biodiversity is given, it is often divorced from advice on productivity. Farmers require advice on how best to incorporate biodiversity considerations into progressive farming systems, whose primary focus is to make a good profit. There is a need to integrate biodiversity in the advisory services for farmers. There is a need to show that biodiversity can go hand in hand with profitable business, through demonstration farms, research centre and processor initiatives, such as organised farm visits. Messages need to be targeted according to the type of farmer.

7.3 Policy makers

Agri-environmental schemes have been in place for 30 years - but habitat quality continues to decline in many categories. Partly this is due to lack of due recognition and inflexible prioritisation/targeting of important habitats.

Farmer action usually follow payments – to ensure Single Farm Payment is not put at risk, or to follow the most lucrative (and permissible) measures supported within an agri-environmental scheme.

In this way, certain important habitats can currently be removed, for example, farm ponds. Implementation of policy can also result in perverse outcomes, such as the removal of potential habitat, to ensure area compliance with Single Farm Payment. More joined up thinking is required by policy makers and by the industry itself, so that these kinds of trade-offs can be more effectively managed.

The current round of CAP is fixed, but it is hoped that beyond 2021 there will be more flexibility in how the CAP and support for biodiversity can be managed at national and regional levels.

Many dairy farms already contain biodiversity areas that are not recognized or valued. If they are not recognized by market forces and/or policy incentives they will decline, because the majority of farmers tend to be driven by economics, and towards greater intensification. To address these risks it is important to consider that:

- Consumers are not the only drivers of biodiversity – how future CAP measures are orientated will be critically important. Policy has a big role to play in incentivising the most appropriate measures for that farm or region, and avoiding perverse outcomes.
- In some contexts, the supply chain is moving ahead of policy makers in measuring and promoting measures for preservation and promotion of biodiversity. Policymakers should get closer to industry, working more synergistically with corporate drivers and market signals.
- Future CAP arrangements should seek to allow more national or regional flexibility to design schemes and measures better targeted at local conditions (pressure, status, response), that will facilitate the maintenance of biodiversity at the farm level.
- At national level, policy makers should give better recognition to valuing broader ecosystems services, particularly if other efficiency metrics are not looking favourable e.g. carbon footprint of beef/dairy produced from marginal areas.

- More generally, there is a strong demand from the farmers that the different policies (agricultural or environmental) fully recognise the major role of dairy farming in addressing the complex biodiversity issue.
- By bringing together farmers, scientists with an understanding of farming, and policy makers it is possible to design support measures that are more targeted and more effective.

7. 4 Processors

Individual farm business selling direct to the public have the opportunity to embed biodiversity as part of their overall offer on provenance to the consumer. There are successful examples of this within the EuroDairy project e.g. Fattoria Rossi in the Italian Operational group.

However, for the mainstream, large-scale supply chains, it is not thought that a consumer premium based on biodiversity is likely anytime soon. This does not mean that the supply chain is disinterested. Positive credentials for biodiversity are increasingly being sought by retailers and processors, as part of Corporate and Social Responsibility charters. However, the complexity of the evaluation of biodiversity impact at farm level is slowing the process.

- It is important that the dairy sector is proactive in pursuit of protecting and/or enhancing biodiversity present within milk production systems. Failure to do so constitutes a reputational risk for industry, and a failure of policy delivery. The industry needs to be forward looking and prepared.
- While it is difficult to recoup premia from consumers from the mainstream market, dairy retailers and processors are actively trying to incorporate biodiversity into their CSR. A big challenge are metrics and measurement for their value chain. However, new technologies are moving fast to enable rapid accurate measurement of habitat.
- More could potentially be done by the industry, as well as individual farmers, communicating and promoting what they are doing for biodiversity.
- There is a need to fix a minimum standard ('what is the minimum level of acceptability') for biodiversity, recognized by stakeholders, industry and NGOs

In conclusion, to progress, there is a need to develop robust metrics, to change the mind-set and awareness of dairy farmers, to incorporate advice on biodiversity into consultancy services, and to find combinations of drivers and incentives via the market or Common Agricultural Policy, which increases the financial viability of the management for biodiversity in the dairy sector. A change in mindset is also needed in advisors to convey the message that profitability, and promotion of biodiversity are not necessarily mutually exclusive, and innovative collective projects at the local level would help to drive this change.

Annexe 1 – Case studies

France

The name of the farm: The Daisy farm

The name of the farmers: Jean-Marc Burette

Location: Fleurbaix, Hauts-de-France

Description of the land: 68 ha, of which 30 ha are used for maize and 5 ha for meadow

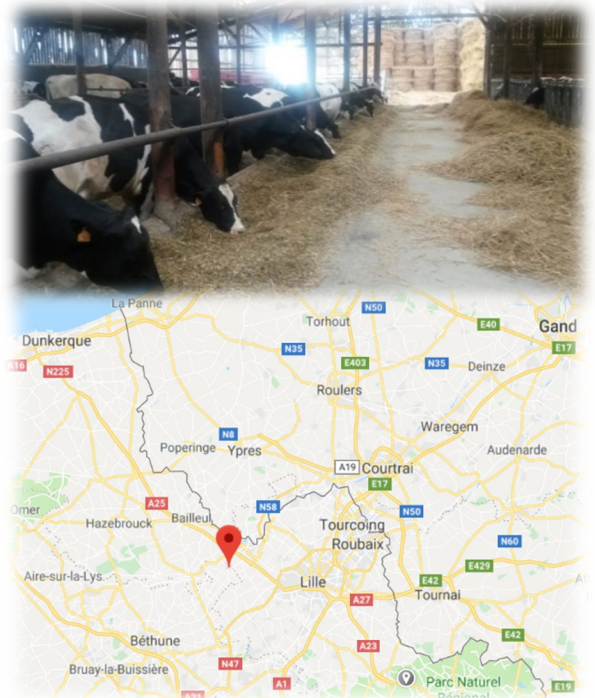
Number of dairy cows: 76 dairy cows

Units of labour on the farm: 1 farmer and a half-time employee

Other productions: Cereals

Main dates of the farm according to the farmer: Establishment of Jean-Marc on the family farm in 1990. In 2012, he started to find solutions to reducing inputs on the farm. The Biotex audit was first undertaken in 2018.

A particularity of the farm: Beehives on the farm / Use of simplified agricultural practices



The Daisy farm is located close to Lille in a suburban area. There are few dairy farms in the area; mainly cropping farms. Consequently, there is less and less pasture and when there is, they are often used for horses. This is a plain area, with ditches for water management and few hedges.

Jean-Marc has always been sensitive to environmental issues. At the beginning of his farming career, he worked as his father before him, because he had to discover and learn everything for himself. Over time, he saw the effect of his practice on the environment. He is especially sensitive to soil organic matter. He saw the effect of tilling and big machines on soil life. A presentation by a student about no tilling was a shock for him and pushed him to change his practices. Moreover, he is an area with many people living in the countryside, but coming from the city and lacking in knowledge about farming. Jean-Marc Burette opened a dialogue, and explained his work, to maintain good understanding between them. Demonstrating good practices really matters for him.

At first glance, the environment of the farm is not favourable for biodiversity. Jean-Marc worked step by step on his practices to improve his impact. First, he stopped tilling. This change was difficult at a time when few farmers worked in this way. He had to find his own points of reference. He had several years of bad results in yield, because the crop cover was not adapted or the weeding was not good enough. To decrease the economic impact of his on-farm research, he created a fund to compensate for the impact. Today he can see the results of his practices: an improved soil life (with many earthworms), an improved water holding capacity and a better plant resistance. For instance, in 2018, when it was really dry, maize from his field was in better shape than others, because there was more water in the soil thanks to organic matter.

He also has grass strips along ditches and rivers. He harvests them late. He often sows strips of mix varieties such as sunflower, Sarasin... which attracts birds. He decreased spray treatment on crops, and treats early in the morning to improve the efficiency of the treatment and decrease the impact on bio control agents and bees. It took him some time to learn this new approach. Fields were not as clean as

expected. However, after a few years, he is satisfied with the results. Moreover, he planted apple trees in a meadow close to the farm. Finally, he worked with a honey maker and has welcomed hives onto his farm.

Jean-Marc is happier in his work and in his personal life, as he works accordingly to his belief - work efficiently, together with nature to protect it and enjoy it. Even if some years, results were not as good as expected, for Jean-Marc it is a part of the learning process. Today the change of practices has had positive technical and economic impacts: less fuel, less pesticides, less fertilizer and healthier crops! Jean-Marc was convinced of the importance of biodiversity. The farm is in an area with low diversity, a few hedges, a few pastures... Therefore, his audit results were average, while the farmer is making a lot of progress on practices that are not taken into account in the Biotex light version.

Jean-Marc sees biodiversity, and more generally, environmental issues as a positive thing on his farm. For him, even an intensive system can have a positive impact on the environment, if you know how to work with nature and not against it. He watched a lot: the plant, the soil, the animals; in order to act less to heal but more to prevent. He would like to convince other farmers not to take environment and biodiversity as a constraint, but a tool to work better and more efficiently.

Italy

Presentation of the farm

The name of the farm: Delsante Farm

The name of the farmers: Mr Delsante

Location: Societa Agricola Delsante Elvezio e Saverio,
Via San Donato 45, Cap 43122 Parma

Description of the land: 112 ha in total

75 ha alfalfa, 3,5 ha temporary grassland, 5,5 ha permanent grassland, 25 ha wheat, 1,48 ha barley, 1,15 ha vineyard, 1,06 ha non-cultivated

Number of dairy cows: 140 dairy cows

Description of the production system

The dairy cows stay inside all year round, as it is the typical dairy production system in this region of Italy. Cows eat mainly alfalfa, concentrate, grass and hay. The milk produced is processed on the farm into Parmigiano-Reggiano cheese and sold directly to consumer.

Units of labour on the farm: The farm employs four people

Main dates of the farm according to the farmer: The farm has been audited April the 23rd, 2018

Biodiversity promoted by:

- 35 large typical trees
- 2 ponds
- Buffer strip and rivers perimeter
- Permanent pasture with mix grass

Gains:

- Healthier stock
- Healthier pasture and crops
- Attract birds that eat pest insects
- Water quality improved
- Higher quality of cheese
- Good financial return for high quality traditional Parmegiano Reggiano



The farm is situated at the periphery of Parma city



Italy is among the richest European countries in biodiversity, due mainly to a favourable geographical position, and a wide variety of geological, climatic and vegetation conditions. It is estimated that Italy hosts 67,500 species of animals and plants. This number represents 43% of the total species

described for Europe and could represent around 4% of the species in the world. For some of the taxonomic groups, the percentages of European species that occur in Italy are particularly high; such as dragonflies, butterflies and saproxylic beetles. The Italian fauna is estimated at more than 58,000 species, of which about 55,000 species are invertebrates, mostly insects, and 1,258 vertebrates.



Delsante farm is contributing to the maintenance of this rich biodiversity by maintain numerous large typical oak trees and fruits trees, 2 ponds and 5,5 ha of historical extensive permanent grassland, with mixed grass and hay dried on the field. He loves spotting wild animals on his farm like pheasants, squirrels, hitch hogs, all kind of frogs...etc.

The results of the biodiversity assessment show that the farm maintains the landscape mosaic diversity and the biodiversity level of the region, through a biodiversity developed area of 0,5 ha (semi-natural habitat) for 1 ha of farm land. The historical permanent grassland provides a balanced diet for the dairy cow, stores carbon and gives an excellent habitat for biodiversity. The alfalfa covers the soil all year round, and gives many flowers, which creates a good habitat for pollinators, birds and bats. Large trees attract birds that eat pest insects and maintain the typical landscape of the region. The two ponds are very important to maintain typical wetland species like dragonflies and frogs.



Mr. Delsante was surprised by the results of the audit: “I was not aware my farm had such a positive impact on biodiversity”. After the farm audit, Mr. Delsante had a better understanding of what is important on his farm to promote biodiversity.

Delsante farm is a good example of a profitable farming business that promotes biodiversity in the region, adds value to the local urban environment and meets consumer expectations. Indeed, the farm directly transforms the milk into a high quality traditional Parmegiano Reggiano cheese. The marketing of the product does not highlight, for the moment, the link between biodiversity, the quality of the cheese and the maintenance of a sustainable landscape around Parma. This link could potentially add value to the product and informs consumers.

The Netherlands

Presentation of the farm

The name of the farm: Maatschap Steverink

The name of the farmers: Henry and Anja Steverink

Location: The Netherlands, region Achterhoek

Description of the land: 44 ha, (9 ha silage maize, 4 ha sown pasture and 30 permanent grassland)

Number of dairy cows: 110 dairy cows

Description of the production system: Henry Steverink is a promoter of grazing. He tries to optimize grass utilization with a flexible grazing system, and grazing until late autumn. He combines grazing with robot milking. His management leads to a high milk output (> 11.000 l milk per cow) at average costs of production. The cubicles in the stable are filled by a robot. The bedding material for the cows is dried digestate. Although he is a very intensive and highly productive dairy farmer, he has a passion for biodiversity and tries to create space and opportunities for biodiversity on his farm.

Units of labour on the farm: The labour force on the farm is 1.8 full time employee (Henry and Anja Steverink with help of a neighbour for half a day/week).

Main dates of the farm according to the farmer: Henry's parents moved their farm to this place in 1978 in a land exchange project. After he finished his studies (1984), Henry worked on the farm together with his brother, but in 1994 the farm was split, and his parents stopped farming. Henry and Anja continued farming together from then onwards. The interest in biodiversity grew gradually. The sense that biodiversity is declining more and more with present day intensive farming was repugnant to them. They started looking for opportunities to change.

Henry is board member of two organizations (a local and a regional) for nature management on farm land, is member of Operational Group Circular Dairy, has built a free-range stable, applies mechanization/automation to decrease work load and labour hours (milking robot and equipment for distributing bedding material in the stable), put 84 solar panels on the roof and often receives visiting groups to the farm.

"I'm always interested to learn, by comparing benchmarking data of my own farm with those of others. That is also the reason that I'm participating in the EuroDairy project, and provide data for Cost of Production, Resource efficiency use and Biodiversity audits." "I was also on an exchange visit to Northern Ireland, and was wondering how farmers there could maintain the landscape values in combination with modern farming."

When you grow older and get more experienced, you will get better insight in relations between your farm and surrounding nature. They have much in common and soil fertility is a key part of that connection. If you are aware of the environment where you are living and dealing with society (which is a priority as a food producer), then you will conclude that you need to create space for biodiversity.

"My own farm is very intensive. My opinion and experiences are that the intensive farming could be combined with greater attention to nature conservation on other parts of the farm. 'Biodiversity will increase more when all conventional farms create 1% extra space for biodiversity, than when the group of 'nature farmers' grow by 5 %."

To measure is to know. Only when you know/survey what flora and fauna species are living on your farm, can you know/measure increases or decreases in biodiversity. You become also more enthusiastic, when surveyors give feedback on what they have found on your farm.

With field margins and hedgerows, you can score rapidly. However, when you want to do more for lapwings or partridges, then you need greater areas and you must work together with your neighbours. At present that is not easy. An important issue is whether society wants to pay for more biodiversity on farm land.

"Dilemma: the landscape is for everybody, but not from everybody".



Poland



The name of the farmers: Jan Mrozeck

Location: Ostroleka, Lelis, Poland

Description of the land: 25 ha of UAA with 20 of permanent grassland and 5 ha of maize

Number of dairy cows: 16 dairy cows

Description of the production system: The dairy cows graze as much as possible on the 20 ha of extensive pasture around the farm, supplemented with maize silage and hay. The small fields are managed in an extensive and traditional manner. Some fields are from more than 5 km distant from the farm. All fields are very small and dispersed in different places, which does not facilitate easy farm management.

Units of labour on the farm: the farm employs Mr. and Ms. Mrozeck and their son

Main dates of the farm according to the farmer: The farm was audited 28th May 2018

A particularity of the farm: Around 10 ha of the farm are under Natura 2000 for habitats and birds



The farm is situated in Ostroleka, about 120 km Northeast of Warsaw

Biodiversity promoted by:

- Specific protected areas for endangered species
- Forest edge
- Rivers perimeter
- Traditional permanent pasture with mixed grass

Gains:

- Healthier stock
- Healthier pasture
- Carbon sequestration
- Water quality improved



Poland's biodiversity is among the richest in Europe. Its transitional climate, which is influenced by oceanic and continental air, its favourable geographical position at the centre of the continent with no natural barriers to the east or the west, its varied geological structure, land and hydrographic make-up and soil types, make it a good habitat for many plants and animal species. The country hosts a total 63,000 species, of which 28,000 species are plants and fungi, and 35,000 are animals (of which around 700 species are vertebrates). Poland is characterized by a rich mosaic of habitats, which are the result of traditional lifestyles in agricultural areas. A high proportion of the agricultural area has high natural value, providing refuge for threatened flora and fauna. Thanks to small-scale agriculture, Poland has retained to this day local crop varieties and traditional breeds.

The farm of Mr. Mrozeck promotes the high biodiversity of the country, through the 10 ha of protected traditional grassland under the Natura 2000 scheme. On top of this extraordinary biodiversity, the farm includes 10 ha of permanent grassland, more than 1 km of river perimeter, almost 1km of forest edge and small group of trees, which are also habitats and shelter for ordinary biodiversity species. The permanent grassland is composed of a rich variety of flora and is extensively grazed or cut late, with the hay dried on the field, which provides an excellent habitat for a rich diversity of species. The biodiversity developed area ratio on the total area of the farm is 1 which means that for 1 ha of farm land the farm generates 1 ha of biodiversity area. Fields are also very small, dispersed and intertwined with other farms fields, which is favourable to biodiversity. The positive impact of the farm is evidenced by the presence of frogs, bibbers, and storks in the fields. The White Stork is one of the most popular bird species in Poland, which has the largest population of this endangered species.



The owner of the farm already knew the importance of protecting wildlife and plant diversity on the farm and the benefit that it produces for the farm health and milk quality. He is also aware of the limits of this model: “extensive pasture is good for flowers, but they are not very good for milk production” Before the audit, he had no precise idea of the biodiversity potential of the farm. With the results of the audit, the farmer is more aware of the value of the high biodiversity level of his farm, and how to maintain it. The farm improves the biodiversity level of the surrounding region, but also the quality of soil and grass on the farm, by virtue of the different species living on the farm (earthworms, birds, spiders, micro-organisms...) which is beneficial to the farm business (they are a source of free labour!)

England

Presentation of the farm

The name of the farm: Home Farm

The name of the farmers: Mary and John Quicke

Location: Newton, Exeter, England

Description of the land: total of 500ha

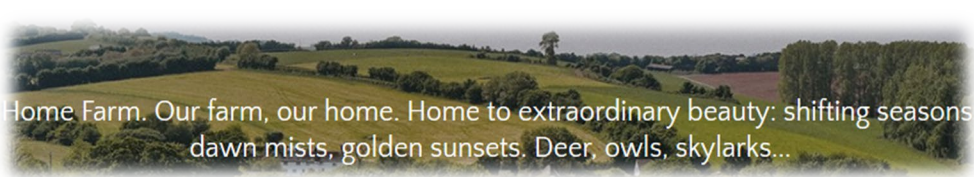
100 ha of arable land for cash crops, 25 ha of maize, 354 ha of grassland including 246 ha permanent grassland

Number of dairy cows: 600 dairy cows and 400 heifers

Description of the production system

The production system is organized around the combination of a spring calving herd and an autumn calving herd, to maintain the

same level of milk production across the year. Production is a so-called “New-Zealand system management”, which means an optimization of the grazing area. Grass growth is measured every week in the paddocks to adjust the grazing strategy. The main grass variety is perennial ryegrass because it grows early in the season and keeps growing late. On top of ryegrass, the fields also contain a mix of clover, chicory, sainfoin, and salad burnet, for a more resilient and balanced pasture.



The herd is made up of a variety of traditional dairy stock: 10% Montbeliarde, 33% Scandinavian red, 2% brown Swiss, 33% kiwi Holstein, 9% Friesian, 10% kiwi Friesian, 3% Jersey. The herd stays outside most of the time.

Units of labour on the farm: the farm employs a total of 19 people from the herd managers to the marketing managers, the finance manager, but also the processing and store managers.

The farm was audited for biodiversity in December 2017.

A particularity of the farm: Around 100 ha on the farm are under the Natural England Higher Stewardship Scheme to protect wildlife, mapping out trees, hedges rows, ditches and specific measures in order to protect these habitats.

Biodiversity promoted by:

- Specific protected areas for endangered Crayfish and Skylark
- 29 km of high hedges
- 20 km of forest edge
- Buffer strip and rivers perimeter
- Permanent pasture with mix grass

Gains:

- Healthier stock
- Healthier pasture
- Carbon sequestration
- Water quality improved
- Higher quality of cheese
- Good financial return for high quality traditional Cheddar



Home farm is working closely with [Natural England](#)'s Higher Stewardship Scheme to protect the wildlife on the farm. The farm has protected over 100 ha of arable and grassland under the scheme. Endangered species like the White Clawed Crayfish and the Skylark bird find a habitat on the farm. Around 40 favourable patches for Skylark nesting have been created on the arable land (spring cereals, green cover) and grassland fields (low stock rate pasture) of the farm; 2500 m of rich species buffer-strip along rivers have been created to protect watercourse and Crayfish habitat. The Skylark eats a large quantity of insects, which keep the fields around healthy. On top of this extraordinary biodiversity, the farm includes 29 km of large hedges, 25 trees, 7600 m of river perimeter, 20 km of forest edge and permanent grassland, which are also habitats and shelter for ordinary biodiversity species. The biodiversity developed area ratio on the total area of the farm is 1,5 which means that for 1ha of farm land the farm generates 1,5 ha of biodiversity area.

The owner of the farm was already aware and convinced for a long time of the importance of protecting wildlife and plant diversity on the farm, and the benefit that it produces on the farm health and product quality. Before the audit, the farm had no specific metrics to evaluate this biodiversity potential. With the results of the audit, the farm can now communicate with more precise metrics and data.

The farm directly transforms the milk produced into a high-quality traditional Cheddar. The marketing of the product already highlights the link between biodiversity, quality of the product, and the principles of maintaining a sustainable diverse landscape in the region. Home farm has found a way to add value to the product, while maintaining biodiversity on the farm and communicate widely on it. School and other group visits tours are regularly organized to the farm.



The success of Quicke's traditional cheddar confirm the fact that it is possible to run a successful business while enhancing landscape and biodiversity of the farm and region around - contributing more widely to rural vitality.

"At Quicke's we respect nature and believe that if we treat this land well, it will treat us well and provide wonders for us and for generations to come."

Northern Ireland:

The name of the farmer: Thomas Steele

Location: Kircubbin, Co Down, Northern Ireland

Description of the land: the farm has 50ha of maize, 25ha of wheat, 10ha of barley, 5ha of Lucerne and 210 ha of grassland, of which half is permanent grassland. Thomas Steele also buys some concentrate to feed the dairy cows. Dairy cows stay inside, but the 400 heifers graze the pasture around the farm. 12,5 ha of the pasture are within a protected area for bird conservation.

Number of dairy cows: 500 dairy cows

Units of labour on the farm: 4 people are employed on the farm to help.

Audit date: 07/12/2017

Biodiversity promoted by:

- Hedges around each field
- Maintenance of permanent pasture
- Maintenance of a protected area on the farm by extensive grazing

Gain:

- Soil erosion prevented
- Water quality improved
- Protected habitat for birdlife
- Maintenance of typical landscape

Thomas owns 12,5 ha in the protected area of Strangford Lough, where he can send heifers for late extensive grazing, which is the best way of maintaining the high biodiversity level of the area without disturbing the bird's life. Strangford Lough is a large sea loch in County Down, in the east of Northern Ireland. It is the largest inlet in the British Isles, covering 150 km². The lough is almost totally enclosed by the Ards Peninsula and is linked to the Irish Sea by a long narrow channel at its southeastern edge. It has been designated a Special Area of Conservation under the EU Habitats Directive, and its abundant wildlife is recognized internationally. It is a winter migration destination for many wading and sea birds. Animals commonly found in the lough include common seals, basking sharks and Brent geese. Three quarters of the world population of pale-bellied Brent geese spend winter in the lough area.

With 500 dairy cows and 400 heifers, Thomas cannot practice extensive grazing on the entire farm, so the rest of the farm is more intensively used to produce enough feed for the herd. This more intensive management of the farm area is in part compensated by conservation of the protected area. Despite the relatively intensive use of the farm fields, the ratio biodiversity developed area/ the total farm area is positive with 1,3 which mean that for 1ha of farm land, the farm generates 1,3 ha of biodiversity through agro-ecological elements, mainly small hedges, grassland and areas of riparian woodland. The farm also improves the landscape mosaic of the region, as its Shannon index is above that of the region.

Thomas is happy and proud to actively participate in biodiversity conservation through the grazing land on the loch, as he is well aware of the importance to protect endangered species. He was reassured by the result of the audit because apart from the extraordinary biodiversity in the protected area, he was not aware of the good level of ordinary biodiversity on the rest of the farm. Thomas manages successfully to combine the maintenance of protected areas, the maintenance of a good level of biodiversity on the total farm area, and an efficient business employing four people. This demonstrates that it is possible to manage a profitable dairy farm that enhances and adds value to the local environment.



Portugal:

The farm is situated in about 100 km North of Porto, in the Barcelos region

Presentation of the farm

The name of farmer: Jose Augusto Mariz Ferreira

Location: Carvalhal, Barcelos

Description of the land: 31 ha in total

30ha maize followed by ryegrass and 1 ha non-cultivated. The farm also includes 7 ha of forest

Number of dairy cows: 130 dairy cows

Description of the production system

There are only 10 ha around the farm buildings, in eight fields. Each field is separated by a tall stone wall. The rest of the 20 ha are fragmented, and located far from the farm, which does not make for easy farm management. In one location, there are 7 fields covering a total of 3 ha, still separated by stone walls. Maize is grown first, and followed by ryegrass on the same field. Dairy cows eat maize and grass silage, with straw and concentrate.

Units of labour on the farm: The farm employs José Augusto and his wife.

Main dates of the farm according to the farmer: A biodiversity audit was conducted on 27th July 2018

A particularity of the farm: The farm is situated in a national reserve, and so it is not allowed to add any new buildings.

Biodiversity promoted by:

- Small fragmented fields
- Stone walls around fields
- Fruit trees
- 1 ha of non-cultivated field
- Forest

Gains:

- Healthier crops
- Reduction of use of pesticides
- Nice traditional landscape

This region of Portugal is characterized by forest and small fragmented fields surrounded by stone walls, which are the result of traditional lifestyles in these agricultural areas, which is favourable to biodiversity. The farm includes also 1 ha non-cultivated, 0,5 ha of fruits trees and 7 ha of forest, which are also conducive to biodiversity. The landscape of the area has exceptional value, and is important for the regional cultural identity, but also to attract tourism.

The positive impact of the farm is signified by the high density of bird's nests and bats in and around the farm buildings, which there is good availability of food and shelter.



The farmer already knew the importance of protecting wildlife and plant diversity, which is why 1 ha is maintained as non-cultivated. Before the audit, he had no precise idea of the biodiversity potential of the farm. He is now more aware of the biodiversity value of the farm, and how to maintain it. Also highlighted was the fact that there can be contradictory measures between biodiversity protection and forest fire prevention, as farmers are asked to cut down trees to reduce fire risk.



Slovenia:

Presentation of the farm

The name of the farm: Kmetija Napotnik Farm

The name of the farmer: Mr. Jakob Napotnik

Location: Topolsica

Description of the land: 34 ha of permanent pasture

Number of dairy cows: 51 dairy cows

Description of the production system

The dairy cows graze whenever possible on extensive pasture around the farm building and receive a supplement of concentrate. Grass is cut for silage, and hay dried on the ground. Heifers graze the very extensive strip pastures far away from the farm, in the mountains.

Other production: the farm also produces pigs that eat whey and produce meat products

Units of labour on the farm: the farm employs four people

The farm was audited for biodiversity in August 2018.

Particularity of the farm: The farm sells 1/3 of the milk to the cooperative, and the rest of the milk is processed directly into cheese, yoghurt, ice cream, butter and fresh milk, which are sold through a farm shop and self-service dispenser.

Biodiversity promoted by:

- Extensive permanent grassland
- Large trees and hedges
- Forest
- Extensive pasture in mountain area

Gains:

- Healthier stock
- Healthier pasture
- Attract birds that eat pest insects
- Water quality improved
- Higher quality of milk product
- Good financial return for high quality traditional milk product



The farm is situated around 80 km from Ljubljana, at the north east of Ljubljana, at 45 min from Austria



Approximately 56% of Slovenia's land surface is covered with forest; other mainly natural areas, natural grassland, wetlands, water bodies, open spaces with little or no vegetation, account for 4%. Thirty five percent of the area is intended mainly for farming. The forests are relatively well preserved, especially in the diversity of the natural composition of tree species and, vertically and horizontally, the structure of forest stands. As far as high-quality landscape is concerned, within the framework of natural features, there is a mosaic-like interweaving of forest and farmland. These categories of land, labelled by CLC2006 as complex cultivation patterns and land principally occupied by agriculture with significant areas of natural vegetation, occupy 23% of Slovenia. The fragmentation of farmland is not desirable from an economic point of view. However, in terms of cultural landscape the resulting diversity, landscape patterns and interweaving of uses encourage greater biodiversity, and represent the natural cultural heritage and identity of the Slovenian landscape.



Living in such an exceptional landscape, Jakob Napotnik is aware of the importance of biodiversity, and the advantage for his farm business. He is also aware of the constraint “small fields and extensive grasslands are good for biodiversity, but they are not very good for business [...] that's why we have no other choice than further processing and selling products directly to the consumer”. The farm business is very successful due to a very high quality of milk product, and a favourable location on the main road for tourists and inhabitants of the area.

Finland

The name of the farm: Timola farm

Location: North Karelia, Eastern part of Finland

Description of the land: The farm has 240 ha of organically managed land, of which 160 ha is grassland. In addition, Timola has 175 ha of forest area.

Number of dairy cows: 72 dairy cows and 64 dairy heifers

Description of the production system: An organic grassland-based system

Units of labour on the farm: Two family workers and one employee

Main dates of the farm according to the farmer: The fields of the farm have been under organic production since 1998, and the animals since 2002.

A particularity of the farm: participation in a specific programme, renewable energy production, on-farm processing



The Timola Farm produces 720 000 kg milk per year with an automatic milking system (one robot). Usually farm harvests silage two times in the summer; average forage yield is 5.5-6.0 t of dry matter. Silage is stored in round bales with own machinery of the farm.

Forage fields of Timola are composed of a mixed species of grass (timothy, meadow fescue, tall fescue, clovers and alfalfa), peas, cereals and oilseed crops, which sets a rich mosaic favourable to biodiversity. For example, clover grasses enable a good habitat for pollinators. In addition to biodiversity improvements, diversified selection of species and varieties and crop rotation give a structured cultivation pattern to the farm.

The fields are surrounded by forest and the farm at Timola improves the biodiversity level of the area, through the maintenance of more open areas. Open fields are habitats for different species than in



forest (especially birds) and the km of forest edge maintained along the field margin also improves biodiversity. Timola also generates biodiversity areas, through other different kinds of agro ecological elements (e.g. riparian zones). The total farm and forest land give a very large biodiversity area by providing different types of habitats. As a whole, milk production also maintains the diversity of landscape in Finland.

The fact that the farm is organic also favours biodiversity because it means that there is no use of pesticides that can have a negative effect on biodiversity. Actually, one reason for the farmer to start organic milk production was to reduce the use of artificial fertilizers and plant pesticides.

Dairy cows and young stock of Timola graze through summertime, which also has positive impacts for biodiversity. In particular, 0.6 ha area of agroforestry increases the diversity of the region with its original species.

At the moment, there are some conflicts with regard to the promotion of biodiversity, and other guidance. For example, if a farmer would like to establish protection zones alongside rivers, and plant trees into the same zone, he would need to double the size for the protection area because of the planted trees. This practice reduces partly the enthusiasm to establish protection zones. From a farmer point of view, also guidelines for maintaining wetlands should be more straightforward.

