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A Values-Based Approach to Exploring Synergies between Livestock Farming and Landscape Conservation in Galicia (Spain)

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Abstract: The path to sustainable development involves creating coherence and synergies in the complex relationships between economic and ecological systems. In sustaining their farm businesses farmers' differing values influence their decisions about agroecosystem management, leading them to adopt diverging farming practices. This study explores the values of dairy and beef cattle farmers, the assumptions that underpin them, and the various ways that these lead farmers to combine food production with the provision of other ecosystem services, such as landscape conservation and biodiversity preservation. This paper draws on empirical research from Galicia (Spain), a marginal and mountainous European region whose livestock production system has undergone modernization in recent decades, exposing strategic economic, social and ecological vulnerabilities. It applies a Q-methodology to develop a values-based approach to farming. Based on a sample of 24 livestock farmers, whose practices promote landscape conservation and/or biodiversity preservation, the Q-methodology allowed us to identify four 'farming styles'. Further analysis of the practices of the farmers in these groups, based on additional farm data and interview material, suggests that all 24 farmers valorize landscape and nature and consider cattle production and nature conservation to be compatible within their own farm practices. However, the groups differed in the extent to which they have developed synergies between livestock farming and landscape conservation. We conclude by discussing how rural development policy in Galicia could strengthen such practices by providing incentives to farmers and institutionally embedding a shift towards more diversified farming and product development.

Keywords: farming styles; ecological capital; natural resource management; rural development

1. Introduction

Although the globalization of food supply chains has brought benefits for consumers, such as year-round availability of food at relatively low prices [1,2], this has come at considerable, albeit hidden, costs which include an acceleration in climate change, increased risks to public health and the depletion of scarce resources [3], challenges that are especially marked with livestock farming. These negative impacts have led to calls for a territorially-rooted approach, which is better suited to

addressing environmental, resource, and economic vulnerabilities [4–7], and for dairy and beef cattle farming practices that are more effective in sustaining and strengthening the provision of multiple ecosystem services. Two general and opposing discourses about farm development pathways can be distinguished. The first, the agro-industrial discourse, considers farms as productive systems solely orientated towards maximizing food production [6,8]. This model sees farm development as driven by externally-provided inputs and technologies that often include prescriptions on how these are to be used [9,10]. It is an approach that favors scale enlargement and specialization, which generally seeks dominion over nature and often modifies the natural environment, including the landscape and biodiversity. The second, territorial, agro-food, discourse, sees farm development as based on co-production between humans and living nature, which implies that farmers shape landscape and nature, and is skilled-oriented, with farmers seeking coherence and synergies between food and fiber production and other farm functionalities [5,11]. Successful territorial strategies necessitate good governance and neo-endogenous development [12,13], both of which include stakeholder participation. From this perspective adaptations to environmental and resource vulnerabilities cannot be simply implemented by governmental agencies and/or regulated by laws and regulatory schemes [9,14]. Instead, the optimization (and hence sustainability) of farm practices needs to be based on the values, principles, and goals held by farmers and other rural stakeholders [15].

The growing emergence of multifunctional farming is largely a response to the need of individual farms and rural areas to diversify their economies: Gibson-Graham [16] calls for a recognition of the heterogeneity in farming practices, both between, and within, different localities. In this article we explore Galician farmers' perceptions on optimizing the balance between landscape conservation and biodiversity preservation on the one hand and productive farming, on the other, in order to show how the transition towards agricultural sustainability is anchored in farm practices. These practices cover a range of activities: food and fiber production and the provisioning of other ecosystem services (ES), which include supporting activities (e.g., nutrient dispersal, biodiversity and seed dispersal), regulating services (e.g., erosion prevention, air quality regulation, climate control, and waste decomposition) and socio-cultural services (e.g., non-material benefits: recreational values, community building and aesthetic qualities) [17]. Our study departs from the theoretical standpoint that ES are the result of farm practices that positively valorize the natural environment [18,19], and that ES make direct and indirect contributions to human wellbeing [20]. Given that there are few agro-environmental schemes in place in Spain, this paper explores the potential for farmers to spontaneously adapt environmentally beneficial management practices as a result of their own value systems and a recognition of the long term benefits that these can bring. We do so by applying Q-methodology to an empirical case study of 24 livestock farmers from Galicia (Spain), a marginal, mountainous, rural area in northwest Spain where the recent shift to more intensive livestock production has revealed key economic, social, and ecological vulnerabilities.

Over past decades Q-methodology has been applied to differentiate between goals and strategies on how to use, and benefit from, available physical and human resources [21,22]. This methodology aims to clarify perspectives in a discourse, and not to construct a representative sample of a population. Q-methodology is suitable for working with small groups of respondents. Practitioners recommend that the number of respondents is smaller than the number of statements in the Q sort; the number of respondents is typically between 20 and 50 (Q-set), while the number of statements is usually between 30 and 50 (Q-sample) [23]. Recently, Pereira et al. [23] applied Q-methodology to examine the diversity of goals and values among early-adopter farmers, who turned out to be a relatively heterogeneous group of progressive farmers, who played an important role in advancing technological adoption among a wider farming community. To our knowledge Q-methodology has not been applied to multifunctional farmers, nor has it been applied in Galicia.

Using Q-methodology, our study explores the assumptions and values of 24 farmers who combine agricultural food production with other functions such as biodiversity, nature, leisure, and quality production. As in the study by Pereira et al. [23], the farmers in our study belong to a subset of early

adaptors. The difference is that our sample contains farmers who are actively constructing synergies between livestock farming and the available physical and human resources ('eco-pioneers') as opposed to those adopting externally designed technologies. In our research we tested how producers value and link or look for synergies between livestock farming and landscape conservation. We conclude that all the respondents in the sample consider that integrating the production of ES is compatible with their farm practices. However, the farmers differed in terms of the means and abilities to improve synergies between ES and their productive activities. Policy programs should address these differences if they are to be effective.

2. A Value-Based Approach

From a socio-economic perspective, farmers tend to perceive and express the natural environment in terms of the monetary revenue that the values it contains generates. Farmers have to earn a living, and their farm strategies are usually based on an economic calculus, which implicitly or explicitly results in trade-offs between economic and environmental assets. Alongside food provisioning farmers (can) provide a range of other ecosystem services but usually they optimize farm production according to what 'adds up' and to what 'remains below the line'. Some of their activities protect and enhance natural resources (e.g., improving soil structure or maintaining hedgerows), while certain forms of farming have a negative impact on the environment (e.g., increased specialization of production and dependency on external resources, such as fertilizers and pesticides, which can pollute soils and water resources). Yet, current and future adaptations to the emerging environmental and resource vulnerabilities may lead to adjustments in land-use and farm practices that reconnect man and living nature, and result in (and stem from) a broader understanding of 'economic value'. Humans can play a role in improving the natural environment, and when they do so, this results in and represents 'objectified and accumulated labor' [24], or 'ecological capital' [25]. Government representatives, researchers and other intermediaries need to understand these (potential) environmental benefits, and how an increase in endogenous natural resources (improvement of the stock and/or quality of nature in an area) can be achieved [25–27] through co-production with nature [28,29], also conceptualized as 'transformative values' [30]. In this context it is useful to situate the provision of ES in relation to wider rural development, and, in order to identify departure points for successful territorial strategies, to study farm heterogeneity.

One can identify three distinct, yet mutually interdependent, aspects that shape the heterogeneity of farms [31]:

- notions or ideas about 'how to farm', i.e., the drivers and motivations for farming that are based on a farmer's reality and needs and his or her cultural beliefs;
- actual farm practices, the strategic actions that are an expression of those beliefs, and;
- the different kinds of internal and external relationships, such as those with markets, technology, and administrative and policy frameworks [31,32].

Van der Ploeg and Ventura [33] (p. 23) have argued that farm practices result from the "*goal-oriented, knowledgeable and strategic behavior of actors*" which is framed, and can be either blocked or facilitated by the institutional environment [31,34,35]. The values of farmers and other stakeholders (anthropocentric values) and the environment (intrinsic values) mutually influence each other, in what is sometimes referred to as the 'convergence principle' [15], and shape the development trajectories which can follow different directions [36,37].

The turn to multifunctionality and more localized production and consumption are often a response to the negative effects of globalization [8,16,38]. Over the past decade, scholars have identified how the negative effects of globalization have encouraged farmers to participate in (or even initiate) programs to enhance ecosystem services [39]. Shifting from production-oriented land-use and expanding the provision of multiple ES often fosters a progressive understanding that the 'local' also, and perhaps paradoxically, contains a strong element of connectivity (among stakeholders in the

region and with the 'outside world') [40] and a realization that food systems are not inevitably shaped by external forces but can be created and actively reshaped through changing local practices [13,41]. This, in turn, deepens actors' understanding of how to combine human and non-human elements in order to achieve these changes [42]. There are now many examples of strategies for successfully linking livestock farming with the maintenance of biodiversity and even technical guidelines for doing so [43].

Scholars have also examined why voluntary agri-environmental programs sometimes fail to meet their objectives [44] and often do not bring about the anticipated changes in farmers' behavior or motivations [45]. The changes needed in farm management require the creation of coherence and synergies between economic systems and the environment, at the level of the individual farm, the regional economy and in relation to wider contexts (e.g., policy frameworks, markets) [13]. This means that we should not solely consider farm practices', which include the management of the fields and biodiversity and the farmer's relations with the farm animals, but should adopt a broader view that encompasses markets and regional policy frameworks. This implies that the focus should not be strictly limited to the 'local' but, following Massey [46], should be considered as an 'activity space': a spatial network of links and activities within which an actor (in our case: the farmer) operates. The concept of activity space describes an assemblage of spatial practices that transcends the local-global duality [40], and includes all actors (animate and inanimate) that shape the farm and its trajectory. The concept offers a heuristic device for studying the socio-spatial connections between the physical and human resources for production and consumption [40,47] that frame farmers' strategic actions and how farmers value, and give significance to, the natural environment.

In the remainder of this paper we use the Q-methodology to explore how multifunctional livestock farmers in Galicia value ES and perceive the combination of productive activities (food and fibers) and socio-cultural services (landscape and biodiversity). We then discuss the different ways in which these livestock producers view the (potential) synergies between livestock farming and providing ecosystem services and how they adapt their farming practices to make use of the physical and human resources that they have access to.

3. Materials and Methods

In Galicia, an autonomous region in northwest Spain, the socio-spatial connections between the physical and human resources for production and consumption have been oriented towards economically optimizing livestock production. Since the 1980s, milk production in areas with good conditions (in terms of soil, climate, and slope) has increased, whilst dairy farming in mountainous areas has virtually disappeared [48]. These areas are becoming economically vulnerable, due to depopulation and the ageing of the remaining population. This is accompanied by a high level (at least 20 per cent) of land abandonment; especially in mountainous areas [49] where the total surface area used for extensive grazing and for crop production has diminished significantly [50]. Galicia is extremely rural (about 97% of its total area is defined as rural) and more than half of its population owns land. Out of a population of around 2.8 million there are 1.6 million land owners, although less than 65,000 of these landowners can be classed as farmers. The average landowner has 1.8 ha of land, spread across an average of seven plots, creating a large 'minifundio' (smallholding) sector [50] (in total Galicia has 11.4 million plots of land). Small farm sizes and the small and scattered pattern of field parcels limit farmers' abilities to run profitable farms. Out of a total surface of almost three million hectares of land in Galicia, almost 400,000 ha are cultivated with crops and just over 300,000 ha are permanent grassland, so the total Utilized Agricultural Area is less than a quarter, with forests occupying a further 45% [50].

Table 1 provides selective data about the intensification of the Galician dairy sector over recent decades. It illustrates the dramatic decrease in the number of dairy farms and the land used for dairy farming, whilst total milk production almost doubled between 1982 and 2009. Since the number of cows has remained more or less the same, milk production per ha, per cow, and per farm has increased.

Table 1. Trends in the Galician dairy sector: 1982–2009.

	1982	1989	1999	2009	AAVR ¹ 82–09	TAR ² 82–09
Number of dairy farms	109,284 ³	85,778 ³	39,375	15,339	−7.01	−86
Number of dairy cows	352,983	475,432	451,916	360,872	0.08	2
UAA ⁴ (hectares)	320,733	352,437	305,135	249,680	−0.92	−22
Milk production (1000 L)	1,474,305	1,861,190	2,169,170	2,286,787	1.64	55
Milk production per hectare	4597	5281	7109	9159	2.59	99
Milk production per cow	4177	3915	4800	6337	1.56	52
Milk production per farm	13,491	21,698	55,090	149,083	9.31	1005

¹ Annual Accumulated Variation Rate; ² TAR: Total Average Rate; ³ Including smallholders: all land owners with land over 0.1 ha which in the 1999 and 2009 data has been adapted to farm structure survey criteria of the European Union (farms with a UAA of over one, hectare or a minimum area on horticulture or a certain livestock and economic dimension);

⁴ Utilized Agricultural Area. Source: Own calculations from the ‘Censo Agrario’ (Agrarian Census), several years [51,52].

The intensification of dairy production was largely driven by the (until recently) attractive price ratio of milk to animal feed and the relatively high prices paid to milk producers until the second half of 2013 [50,53]. The relatively high dependence on purchased animal feed among Galician livestock farmers [48], extreme fluctuations in feed prices on the world market, and the dependency of Galician farmers on these external inputs (dependence on animal feed is a major contributor to Galicia’s negative agrifood trade balance) made many livestock producers economically vulnerable. Mountain farmers (at altitudes between 800 and 1400 m) face less favorable natural conditions, and have half the number of animals on twice the amount of land (0.6 livestock units per ha) than lowland farmers. Only a few mountain farmers have dairy cattle, and, although not a statistically significant sample, subsidies make up over one-third of their farm revenues. In addition, the average family size is higher and owners are older [48], reflecting the general demographic of rural Galicia [50]. The income that mountain farmers derive from livestock production is often not the only, or most important, income source (which is often supplemented with the retirement pensions received by household members) while many of the incomes of lowland farmers’ (often dairy farmers) largely depend on revenues from livestock production [48].

Galicia has around 10,000 dairy producers and 350,000 dairy cows and accounts for around 40 per cent of total Spanish milk production [53]. In this context, the vulnerabilities mentioned in the previous paragraphs challenge the competitiveness and future of Galician livestock production. The abandoned land (hundreds of thousands of hectares of land that could potentially be an endogenous resource base) could help livestock producers in the lowlands to significantly reduce their costs (e.g., through accessing nearby land, reducing external fodder input; in combination with a different farm optimization [54]. In addition a revival of livestock and crop production in remote mountainous areas could significantly reduce the risk of forest fires, which have been increasing as a result of land abandonment [50,55].

Farmers’ opinions or ideas about how they might farm better may differ from how they actually operationalize their farms and livestock production, due to structural conditions, such as laws and a lack of market opportunities and public support schemes. Since there are very few formally supported agro-environmental schemes in Spain, we set out to explore the potential for farmers’ adopting management strategies that support ecosystem services as a result of their socio-cultural values [54,56]. To do so we applied the Q-methodology, a simple and fast exercise in which respondents are asked to reply to a number of statements, the responses to which can help classify them as following one of several management styles. Respondents respond to a selection of statements (the ‘Q-sort’) on a scale ranging from ‘strongly agree’ to ‘strongly disagree’ in interviews that last approximately 40 minutes [22]. The list of statements was built from an in-depth study of the main features of the Galician farm sector and the general landscape characteristics that involved interviewing key-informants (researchers, government representatives and farmers), participating in a regional event on the future of rural Galicia (‘Encontro Rural Imaxinado: do presente ao future porvir’, held 13 November 2015 in Lalín) and carrying out additional desk studies (literature, reports,

and newspaper articles on Galician farming). Together this provided us with the necessary background information to develop a set of statements, which was tested in pilot interviews and subsequently reduced from 54 to 49 statements (see Appendix A).

The second stage consisted of the application of the Q-methodology and additional on-farm interviews that provided us with farm data in order to deepen our understanding of the interrelations between livestock farming and landscape conservation. Since we could not draw on a list of farmers participating in agri-environmental schemes we selected our sample from recommendations from key-informants about farmers who were pursuing more ecological farming strategies and seeking to create synergies between livestock farming, landscape conservation, and biodiversity preservation.

Twenty-four farmers participated in the second stage (of whom 21 were full-time farmers). The sample was made up of five organic dairy farmers (DO), six organic beef cattle farmers (BO), four conventional dairy farmers (DC), and nine traditional beef cattle farmers (BC). The farmers (some women, but mostly men) in the sample aged from 26 to 70 years old. Farm sizes ranged from 35 to 100 ha for beef farms and 30 to 100 ha for dairy farms. The number of beef cattle varied between 25 and 73 head at individual farms and between 114 and 324 at farms grazing communal land (a special feature of Galician farming). The number of milking cows at the dairy farms ranged from 21 to 90 head, and total milk production from about 200,000 to 800,000 kg per year. In general dairy farmers had a relatively high milk production (between 7500 and 8500 kg milk per cow/year) on both smaller- and larger-scale farms. The sample included specialized beef and dairy producers and farmers who had diversified their farm production. Among the diversification activities were horticulture production (onions, tomatoes), processing raw materials (milk and meat), and selling farm production (raw and processed materials such as cheese and beef products) through short food supply chains. In some cases farmers sold their produce directly to consumers, in other cases they sold specialty products through a cooperative. All the respondents were first asked to organize the Q-sort in three simple piles: 'agree', 'neutral', and 'disagree'. Next, farmers scored the statements in a grid scale that forces the statements into a quasi-normal arrangement, with -5 represented 'strongly disagree' and $+5$ 'strongly agree'. Scores around zero meant that farmers were indifferent to that statement. After that farmers briefly explained why they had selected the statements that they ranked as $-5/+5$.

The PQMethod software version 2.35 [57] was used for the data analysis. The PQMethod software calculated the correlations among Q-sorts and performed a principal components analysis (PCA). The resulting factors were rotated using Varimax rotation. The default analysis produced eight un-rotated factors so, in order to select the number of factors to be rotated, the standard protocol for Q-methodology was followed in which an eigenvalue of more than 1.0 is needed to be statistically significant, as well as at least two of the Q-sorts loading significantly on that factor. This resulted in four significant factors, discussed in the following section.

4. Results

The outcome of the factor analysis using PCA and subsequent Varimax rotation is presented in Table 2. Four outcome factors were identified that represented the different attitudes of the farmers towards farm development: 'Diversifying Farmers' (A), 'Conventional Farmers' (B), 'Businessmen' (C), and 'Economical Farmers' (D). These factors represented 63% of the total variance and accounted for 21 of the 24 participants.

All the organic producers (types DO and BO) were classified as 'Diversifying farmers' (factor A) and around one third of non-organic farmers also fell into this group. The other conventional farmers were distributed among the three other groups. The differentiation in scores on the statements resulted in the distinction of four patterns of coherence which were based on the on-farm interviews, and further analyzed and interpreted in terms of how farmers differently valorize the natural environment. However, we were not able to classify all the farmers in the sample: 12% of the sample did not fit in with any of the identified groups, whether due to error or because of their individual, idiosyncratic attitudes.

Table 2. Diversity in farm management among farmers in the sample (source: own field data).

Management Orientation	Allocation of Farmers to Factors (Styles of Farming)				Unclassifiable
	Diversifying Farmers (A)	Conventional Farmers (B)	Businessmen (C)	Economical Farmers (D)	
Farm Type					
DO ¹	5				
BO ²	5				1
DC ³	3	1			
BC ⁴	1	1	3	2	2
Total	14	2	3	2	3
Variance explained (%)	32	10	12	9	
Eigenvalue	9.776	2.9143	1.4550	1.3093	

¹ DO: organic dairy farmers; ² BO: organic beef cattle farmers; ³ DC: conventional dairy farmers; ⁴ BC: conventional beef cattle farmers.

4.1. Management Orientations and Ecosystem Service Provisioning

All the farmers in the sample recognized the aesthetic and biodiversity values of the Galician landscape. However, the integration of these values into daily practices differed between farmers. Diversifying farmers (group A) most clearly expressed their interrelations with the natural environment, and built their farm strategy upon the locally-available resource base. They combine productive farm activities (milk and beef production) with other opportunities provided by the natural environment, such as locally marketing food products and agro-tourism activities. The conventional farmers (group B) farmed more intensively and perceived limitations in terms of the productivity of the land, which necessitated the use of artificial fertilizers to improve the productivity of their grassland. In comparison to the other groups, these farmers put less emphasis on their interrelations with landscape and nature. The businessmen (group C) ran larger holdings (in terms of the number of cows and the size of the holding) and use productive cow breeds. The main limitation that they perceive is access to land, which often leads them to rent land, either close by or at a distance. They focus on the financial aspects of feeding their cattle but pay little attention to cost reduction strategies (fertilizers, fodder input, medications, etc.). The economical farmers (group D) often apply a cost reduction strategy in combination with a less intensive farming practice and tend to keep less productive, but more robust, breeds. They value living in the countryside and look to make their living from farming. One notable feature of farmers in this group was the high value that they place on living in a family setting.

4.2. The Convergence Principle: Farmers' Expressions, Synergies in Farm Development, and ES Provisioning

Table 3 provides examples of how farmers in the different groups expressed their relationship to the landscape and nature, and how they valorize ecosystem services. Conventional farmers perceived activities such as closing nutrient cycles and improving soil quality, to be less relevant for farm development than the farmers in the other groups (see for example farmers BC17 and DC8), whilst economical farmers (for example farmer BC22) look to optimize farm performance by boosting the resilience of their natural resource base. One example of this was to keep traditional breeds (e.g., farmers BO12 and BC22), an optimization strategy in which farmers keep hardier, but less productive, breeds of livestock that are better adapted to marginal, mountainous areas and can thrive on poor grazing land, with minimal intervention. Farmer BO12, who indicated that natural production processes and limits inspire his farm strategy, regarded his contribution to animal biodiversity and landscape aesthetics as also providing socio-cultural services. Farmer DO3, who diversified his strategy along similar lines, also related his way of livestock production to community building and the provisioning of recreational and aesthetic landscape values. While farmer DO3 adds value through direct farm sales and agro-tourism (offering rooms), the non-monetized assets he produces (e.g., the aesthetic landscape value) can be described as a socio-cultural service. Farmer BO12 was

aware that environmental management schemes could increase the value of his beef production, as he would receive payments for certain ES in addition to the subsidies he currently receives by virtue of being an organic farmer. Farmer DC9, not only recognized the their aesthetic and ecological value of hedges and trees, but also that they provide valuable ES: reducing erosion and the runoff of nutrients from the fields, attracting pollinators and insects that control pests and diseases, and providing shelter for the animals. The analysis shows that farmers in the diversifying group are more motivated than the others to provide ecosystem services, because they are more cognizant of their benefits, and also recognize their broader societal value.

Table 3. Farmers' reflections on the provisioning of ecosystem services.

Diversifying Farmers
'Hedges and trees delimit the plots and restrict the access of the cattle to other areas. They function as natural fences and also create a microclimate, protecting the cattle from the wind.' (DC9)
'I believe that our type of production is more oriented to improving our quality of life as well as the quality of life of our animals; hence, we aim to enhance the relationship with nature.' (BO12)
'Working with living beings is a huge responsibility. You cannot compare it to working with inert things. It is essential to give the animals living proper conditions as well as taking their welfare into account.' (DO2)
Conventional Farmers
'A reduction in the use of chemicals would be better for the human health and the animals but in this area you need a lot of chemical fertilizers in order to produce enough fodder, we spend a lot of money on chemical fertilizers, since there is not enough manure to fertilize all the plots and because the cows are permanently in the paddocks, there is no chance to collect the manure.' (BC17)
'Cows can get sick when they eat pasture that has been sprayed with pesticides but it is not profitable to convert to organic production.' (DC8)
Businessmen
'We have too many cows but not enough land to maintain them hence we have to rent more land for the cattle, so we rent land in an area close to Leon [called 'Las Brañas', distant pastures located just outside Galicia at an altitude of between 1000 and 1300 m where cattle can stay from the end of April to the end of November, AOT]. It is around eight hours from here by foot.' (BC16)
'If you have a good income but do not know how to manage it then the farm will have financial problems, so it will collapse. [...] I used to take the cattle to Las Brañas but I consider it too far and too time consuming so I now rent land closer to my farm.' (BC19)
'It is important to re-invest the money you earn in the farm.' (BC20)
Economical Farmers
'I try not to use pesticides unless it is unavoidable, pesticides are not good for the environment, health nor the animals. I would prefer to lose a potato rather than to treat it with sulphate, but it's different with animals if they get sick I prefer to give them the antibiotic instead of letting the animal die.' (BC22).
'The Vianesa [an autochthonous cow breed, PS] survives better in our conditions: they do not get sick and do not need much attention or involve extra work.' (BC22)

The dairy and beef cattle producers in our sample recognized the value of traditional landscape elements and made use of them in their production practices. The diversifying farmers provided the most detailed description of the benefits derived from traditional landscape elements. Apart from recognizing the benefits of supporting services, such as enhanced soil fertility and animal biodiversity (mainly livestock but some also spoke about pollinators and beneficial pests), they frequently mentioned the socio-cultural benefits provided by traditional houses and buildings, stone walls, and hedgerows. During the interviews we noticed that quite a few farmers rented nearby plots which,

given the Galician context of small, scattered plots, is often not easy to do. One conventional beef producer in a mountainous area had been able to rent land close to his farm, which meant he no longer had to take his cattle to more distant land, higher in the mountains. This tendency, of allowing upland pastures to revert to forestry poses a dilemma. From a societal point of view it increases the risk of forest fires devastating the upland ecology. Yet from the individual farmers' point of view it is completely logical as driving the (beef) cattle to upland pastures and regularly checking on their welfare is extremely time consuming. Dairy farmers do not have the option of summer grazing their livestock on distant pastures, but the high ratio of cows to land poses other problems: specifically, transporting grass onto the farm. One large-scale dairy farmer planned to address this by reducing the number of cows and using their milk to make cheese on-farm in order to increase the value added per kg of milk.

5. Discussion

Attempts are being made to diversify rural economies through secondary and tertiary activities (such as services, tourism, SMEs, technology, and industries). While these activities are becoming increasingly important as sources of incomes and jobs, primary activities (agriculture and forestry) still largely determine rural land-use patterns. Given the gradual decline in production subsidies and the shift in European policies towards promoting more balanced and more sustainable territorial development, farmers face the challenge of adjusting their farm businesses so that they are less reliant on productivist agriculture. One way of doing this is by becoming involved in conserving the landscape and biodiversity. This can bring multiple benefits, it can:

- make farmers more reliant on their own resource base and less so on purchasing inputs (thereby reducing their costs);
- (under the right circumstances) be a direct source of income (through 'Pillar 2' subventions), and;
- improve the attractiveness of the rural areas and provide the basis for other rural development activities from which farmers can, directly or indirectly, benefit.

Our study shows that dairy and beef cattle farmers involved, to some extent, in providing ecosystem services have different perceptions about the benefits and potential of doing so. Understanding this heterogeneity in farmers' perceptions, and their farm practices, is useful in shining light on possible departure points for promoting more sustainable agricultural practices in Galicia and other marginal European agricultural regions.

Farming styles research is a well-established approach for studying farm heterogeneity. According to farming style theory, farm practices are the expressions of the strategic actions of actors, and are influenced by cultural beliefs [31]. In order to identify differences in perceptions and attitudes about the natural environment among Galician livestock producers we applied Q-methodology, a research tool that merges quantitative and qualitative techniques in the analysis of subjectivity ('viewpoints' or 'discourses') [58]. Its quantitative aspect makes use of statistics and mathematical techniques in data-collection and analysis, and its qualitative component focuses on respondents' values and beliefs. This allowed us to group the farmers into different farming styles, according to their values and goals and, to some extent, to grasp how these values influence their practices.

We did experience some limitations with applying the Q-methodology. Since Q-methodology involves farmers responding to a pre-determined set of questions there is a risk that this methodology does not fully capture farmers' attitudes and perceptions but that these are pre-filtered through a structure established by the researcher. The methodology delivers a classification of management perceptions and attitudes but does not demand that respondents clarify the classification (in a way this influences the classification). In our research we asked the farmers to briefly explain the two extremes of the results of their individual Q-sort but this did not result in farmers' clarifications on differences of attitudes and perceptions among farmers in the sample. By contrast, farming style research combines analyses of farm economic data and in-depth interviews in which farmers are asked to explain how

their farm management strategies differ from those of their peers, thus inviting them to think about their farming strategy from a comparative perspective. As such farming style analysis provides a tool to study farmers' perceptions, realities and development trajectories, and how these compare to those of others. As such it captures the crucial interrelations between farmers' cultural ideas about how to farm well, the farming practices they employ and the networks (the market, technology, and administrative and policy frameworks) in which farmers and their farms are embedded [31]. Further, while the sorting of statements enabled us to classify respondents according to their attitudes and values towards farm management, it was not sufficient to draw hard conclusions concerning their influence on farming practices. While farmers' ideas and motivations are often congruent with farm practice we could not verify whether the differences in value orientations revealed by the Q-methodology led to farmers' adopting different farming practices. This leads us to conclude that there is a need to complement this research tool with other methods that allow for better identifying differences in farming practices and farmers' interactions with institutional environments. This would enable future research to ascertain how empirically-grounded differences in farmers' value orientations influence their practices and the institutional embedding of their combined provisioning of food and ecosystem services (ES).

One theme to emerge from the research is how farmers, in order to reduce their vulnerability and keep their farm business viable, struggle with balancing the land–animal ratio. This is expressed in terms of both the number of animals in relation to available farmland, as well as matching the cow breed with the grassland conditions (less productive cow breeds that are more robust and can be more easily maintained in less favored areas). Farmers' ideas and motivations are often congruent with their farm practices, and stem from their belief that they can make a living from the resources available to them, which includes their cows, machines, and the locally-available biodiversity. Yet, these resources only become valuable when farmers recognize their potentials, and how to turn these potentials into benefits. This can result in monetary income (through market exchanges) but can also be re-invested in the farm (strengthening and sustaining it). The differences in farmers' attitudes and strategies stem from the resources that they perceive to be available to them: both externally (such as artificial fertilizers or credit) and internally (the natural resource base that farmers turn into ecological capital). When farmers face difficulties in accessing land, they are more likely to buy more feed and fodder and, in order to finance these inputs, are often led to increase the farm scale (either in terms of land or the number of animals), a strategy that is often in the interests of upstream industries and the banking sector. Farmers with access to sufficient land appear to develop their farm differently from farmers who lack such access. We noted a similar split between those farmers who rely on veterinary services and medicines and accept the monetary costs of keeping animals productive (according to scientifically-based risk reduction) and those who work towards, and rely on, improving the soil-plant-animal-manure balance in their own fields in order to improve resistance to infections and diseases (a strategy based on farmers' experiences, as one of the farmers explained).

Although all the farmers in our sample have some interest in strengthening their farms' interrelations with landscape and nature, the farmers who keep hardier but less productive breeds (a cost reduction strategy that lowers reliance on externally-provided inputs and technologies) were more enthusiastic and optimistic about strengthening these interrelations. We also noted that, for very practical reasons, farmers tend to abandon more distant plots when they can do so (either by acquiring access to more conveniently located plots or by restructuring their farm business to allow them to abandon the more distant plots). This raises questions about the ongoing problem of land abandonment on remoter, upland areas and whether this can be countered through policy measures. While farmers' attitudes towards benefitting from potential synergies between livestock production and landscape conservation will play a role in this, this will far more critically depend on the Spanish and Galician authorities tapping into European funding mechanisms to protect these ecologically, economically and socially vulnerable areas.

Finally, we explore how policy can further encourage the provision of ES, and landscape conservation in particular, by being more explicitly and directly aligned with the differentiated

value orientations and practices of Galician farmers. To really understand which farming styles are best suited to delivering ecological and social services, and under what conditions, one also needs to consider three policy issues:

- How is EU Regulation 1305/2013 (supporting farm diversification strategies and improvement of environmental performances) translated into local development, i.e., territorial cohesion?
- To what extent does EU Regulation 1307/2013 (the new first pillar multiple-purpose payments) actually enable territorial cohesion?
- To what extent do European Rural Development Plans, and particularly the Galician Rural Development Plan, encourage farmers to adopt sustainable and multifunctional land-use as part of their farm business strategies?

To this end Spain's Rural Development Plan should include more measures to support land-use activities that maintain and enhance the natural resource base and strengthen the provision of ecological and socio-cultural services. There are mechanisms within the European policy framework to encourage farmers to collaborate (Measure 16—collaboration) and jointly design land-use strategies (Measure 10—environmental protection). Such mechanisms enable farmers to engage in landscape protection and encourage biodiversity in ways that transcend the limits of the individual farm unit—and the strategies available to individual farmers (such as reducing the use of agrochemicals). The funding that such mechanisms can bring can provide a valuable counterbalance to the increased volatility of market prices that often threatens farms' economic security. Such schemes, that reward the provision of public goods, alongside the adoption of cost reduction strategies that involve less use of external inputs and technologies, are increasingly important elements in ensuring the continuity and success of livestock farming in other European regions [27]. Apart from providing some degree of financial incentive to farmers to adopt more sustainable farming practices, agro-environmental, and related schemes also provide crucial structures that enable such practices to become embedded in local farming repertoires, especially in the initial stages. Additionally, while the European Rural Development Regulation [59] allows space for measures that encourage the restoration, preservation and enhancement of ecosystems (priority 4) such measures are currently absent from Spain's Rural Development Program (RDP) [60].

The Galician RDP acknowledges this priority and has made a start in pursuing priority 4 measures [61] (pp. 169–170), but these could be extended by creating platforms for local groups of stakeholders (under Measure 16, 'Cooperation'), in order to identify the types of nature, landscape, and biodiversity that they wish to protect and develop and to design strategies for so doing (under Measure 10, 'Environmental Protection'). The current Galician policy framework also provides other opportunities for promoting more multifunctional livestock production and more localized production and consumption patterns. EU Rural Development priorities [59], such as knowledge transfer and innovation (priority 1), farm viability and competitiveness (priority 2), and food chain organization and risk management (priority 3), are all mentioned in the Galician RDP, and could help farmers to adjust their land-use and farm practices so as to reduce environmental and economic vulnerabilities. At the same time the inclusion of new optimization features (ecosystem services beyond food production alone—included in priority 4) has the potential to enhance farm productivity and incomes, which could improve the economic viability of dairy and beef cattle farmers in Galicia and improve the attractiveness of the region's rural areas for tourism and for new residents. Establishing structures to enable participatory design on landscape conservation (under Measures 10 and 16) could have a beneficial impact on the economic performance of farms through providing support for diversification (priority 3, 'New Investments in Small-Scale Processing, Marketing and Product Development' [61] (p. 168)) and through adding value to primary production by linking landscape-specific biodiversity to the reputation of products and their quality features. In this way the first three priorities of the Galician RDP could be used to catalyze a shift in the strategic behavior of farmers, aligning anthropocentric values (of farmers and other stakeholders) and intrinsic values (the natural environment), and deliver ecological and social services through product development.

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Appendix A

Table A1 contains the statements used in the Q-sort exercise done with the 24 farmers in the sample. The statements have been presented to the farmers in Spanish (Table A1 represents these translated into English).

Table A1. Statements used in the Q-sort.

Statements on Business Orientation (1 to 15); Farm Development (16 to 25); Farm Autonomy (26 to 29); Farmer’s Identity (30 to 40); Animal Welfare (41 to 44); and Nature Conservation (45 to 49)

1. Planning and financial management are the most important parts of running my farm.
 2. My goal is to diversify my assets by having both on and off farm investments.
 3. I am not willing to adopt more sustainable approaches if it means sacrificing the farm’s yield.
 4. I use whatever fertilizers and pesticides needed to get the maximum profitability.
 5. I am not willing to sacrifice farm profitability to conserve water or other resources.
 6. I farm to make money.
 7. My goal is to increase the number of animals and therefore increase my productivity and profitability.
 8. I strive to increase the production [milk/meat] of the farm.
 9. I rent some machinery from the producers’ cooperative.
 10. My goal is to increase my farm’s production and to increase my income.
 11. I want better prices for the milk I produce and so try to negotiate the prices.
 12. I want to have specialized production, producing just meat or milk.
 13. My income mainly comes from the on-farm activities.
 14. As a farmer I always have to bear in mind how any decision I make will affect my farm and my family.
 15. My goal is to expand the farming area, by renting or buying land.
 16. I only intensify my production milk/meat with resources I already have.
 17. By improving the fertility of my cattle I will improve the quality of the milk/meat and my income will also increase.
 18. I improve the quality of my pastures, in order to raise the milk quality and my income.
 19. I am satisfied with the present level of development on my farm and I intend to develop it further by renting some more land.
 20. I am satisfied with the amount of land I have to farm now; and since land is very scarce in this area nobody wants to rent it out or sell it.
 21. I am not interested in having a big farm, or increasing my production.
 22. The land I own is enough to produce, so I do not need to rent more land.
 23. The land I have is not enough to produce so I rent most of the land.
 24. The land I have is made up of several scattered plots, which increases my workload and makes it unattractive to increase the number of animals.
 25. My farm produces (most) of its own fodder.
 26. I sometimes/often employ external labor.
 27. Family members come and help with the tasks on the farm and provide the main labor force.
 28. Government loans and subsidies are very important and/or helpful.
 29. My goal is to reduce my workload and improve the quality life of my family.
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Table A1. Cont.

Statements on Business Orientation (1 to 15); Farm Development (16 to 25); Farm Autonomy (26 to 29); Farmer's Identity (30 to 40); Animal Welfare (41 to 44); and Nature Conservation (45 to 49)

30. A good farmer concentrates his energies on the farm and is not sidetracked by interests or activities outside the farm.
31. The best part of farming is to have your family working alongside you.
32. I am a farmer because I like what I do.
33. I am a farmer because it is the family tradition, the family has owned the farm for many generations.
34. Farm work needs to be done but there is no great joy in it.
35. My long-term goal is to learn how to manage resources in cooperation with nature.
36. I consider it important to maintain a basic relationship between animals and human being.
37. In order to maintain healthy animals a good farmer considers three levels: the physical, the biological and the social.
38. Organic farmers feel more satisfaction knowing that they are doing things 'right'.
39. Farm tasks must take priority over family time.
40. The cattle spend all their time in the stable.
41. I would prefer to have an extensive farm.
42. Calves and cows graze freely in the paddocks and are able to eat as much as they want.
43. A good farmer gives the animals proper care, considering them as living beings and part of nature.
44. Farmers today need to be sensitive to the environment by reducing their use of agro-chemicals.
45. I am doing everything I can do be environmentally aware and conserve the land I farm.
46. Working close to the nature is difficult and unrewarding
47. I consider reducing pesticide use as one way to improve living and working conditions on the farm.
48. I want to increase biodiversity on my farm even if it means taking land out of production.
49. I do not know the effects that pesticides may have on my farm.
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