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Different approaches to the social vision of communal land management: the case of Galicia (Spain)

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Abstract

Communal forests, or Montes Veciñais en Man Común (MVMC), are a specific form of communal land tenure and a singular legal category in Galicia. The growing demographic decline in rural areas and, particularly, in inner areas of Galicia has led to a decrease in the economic interest of forest resources. The complexity of the different management modes or levels of organization of forest communities cannot be explained through a homogeneous interpretation. The objective of this paper is to determine the types, distribution and sources of conflicts, and to describe the role of conflicts as catalysts or barriers for common land management. For that purpose, local, provincial and regional newspaper reports about forest communities were compiled from libraries and the conflicts reported in the media were defined and classified. Spatial analyses, descriptive statistics and statistical classification methods were used to find correlations between the different social, economic or environmental variables involved. Our results reveal a very uneven spatial distribution of conflicts over common land and a stronger impact of social and environmental factors over economic factors. In addition, this paper discusses the interpretation of the higher or lower degree of conflict as a positive or negative contribution to the management of privately owned common land and explains how factors such as the demographic situation in the area, the relationship with the Forest Administration and the incorporation of new actors in the region account for the current situation and the changes in management models.

Additional key words: collective private ownership, conflict, uneven spatial distribution.

Resumen

Diferentes aproximaciones a la visión social en la gestión de tierras comunales: el caso de Galicia (España)

Los Montes Vecinales en Mano Común (MVMC), son una forma específica de tenencia de la tierra comunal con una categoría jurídica singular en Galicia. El declive demográfico cada vez mayor en las zonas rurales particularmente en las zonas interiores de Galicia ha ocasionado una disminución en el interés económico de los recursos forestales. Los diferentes métodos de gestión y niveles de organización de las comunidades muestran una realidad compleja que no puede ser explicada a través de una interpretación única. El objetivo de este trabajo es determinar los tipos, la distribución y las fuentes de origen de los conflictos, para describir su papel como catalizadores o barreras para la gestión. Para ello, fueron recopilados informes de los periódicos locales, provinciales y regionales acerca de las comunidades forestales, y las noticias de conflictos se definieron y clasificaron de acuerdo a un análisis espacial, estadística descriptiva y métodos de clasificación numéricos, encontrándose correlaciones entre las variables sociales, económicas o ambientales. Nuestros resultados muestran una distribución espacial muy desigual y un mayor impacto de los factores sociales y medioambientales sobre los factores económicos en los conflictos en la tierra comunal. Además, se discute la interpretación del mayor o menor grado de conflictividad como contribución positiva o negativa a la gestión de tierras comunales de propiedad privada y explican factores tales como la situación demográfica en la zona, la relación con la Administración Forestal y la incorporación de nuevos actores representan la situación actual y los cambios en los modelos de gestión.

Palabras clave adicionales: conflicto, distribución espacial desigual, propiedad privada colectiva.

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Abbreviations used: GIS (geographic information system), INE (Instituto Nacional de Estadística), MVMC (Monte Vecinal en Mano Común), PCA (principal component analysis).

Introduction

Forests and forest land provide many resources and services but have often been at the source of conflicts. From the 1960s and 1970s, the convergence of interests and collectives that demand goods and services from forests has increased the number of conflicts (Hellström, 2001) in different ways and at different levels of intensity (Keltner, 1990; Walker and Daniels, 1997). Similarly, other factors such as positive population trends may promote social, economic and environmental conflicts (Van der Ploeg and Roep, 2003).

Generally, conflicts have negative effects on forest management (Druckman, 2005), but the key to understanding and answering to the new social demands in forest areas (Hellström, 2001) and the structural changes in rural societies (Lehtinen, 1991) lies in the nature of conflicts. Accordingly, many authors have analyzed conflicts in forest areas. Ellefson (1992) analyzed the resolution of conflicts over forests, focusing on policies and participants; Sidaway (1997) studied different approaches to conflict management and resolution; Bostedt and Mattsson (1996) analyzed the regulations and legal instruments developed by institutions and governments for the resolution of environmental conflicts; Walker and Daniels (1997) portrayed conflict management as a triangle of three interrelated dimensions: substance, procedure and relationship; Skutsh (2000) analyzed the types of conflicts and related them to the forms of resolution; Hëllstrom (2001) proposed a set of indicators for the analysis of conflicts over forests categorized according to theme, intensity, actors, dimensions of the conflict, communication, relationship with other actors, policy and economic aspects; Pinto Correia *et al*. (2006) presented a holistic approach for the resolution of environmental conflicts; Barli *et al*. (2006) made a descriptive statistical analysis of a number of indicators related to conflicts over forests; De Jong *et al*. (2006) performed a qualitative analysis of conflicts in three forest areas, and Brehm (2007) applied grounded theory to the analysis of environmental conflicts. Ibarra and Hirakuri (2007) performed a qualitative analysis based on interviews with experts, and Hovardas and Korfiatis (2008) analyzed changes in the environmental policy of an area using local and regional newspaper reports and their impact on forest management patterns. Elands *et al*. (2004), Maskey *et al*. (2006), Djamhuri (2008), or Schlueter (2008) made further contributions to the resolution of conflicts in forest areas. In this research, forestry conflicts are broadly viewed as struggles of varying intensity between interest groups, over values and issues related to forest policy and the use of forest resources.

Regardless of its function and use, common agricultural and forest land has played a key role in rural economy (Glück, 2000; Short, 2000; Maskey *et al*., 2006; Pagdee *et al*., 2006), has been a source of sustainable rural development and has contributed to satisfying the socioeconomic needs of the rural population (Elands *et al*., 2004). The arrival of a competitive economy to international markets brought about important changes in traditional land uses and management practices (Pardo and Gil, 2005), which had to conform to the new socio-economic situation (Hoogstra *et al*., 2004; Olsson *et al*., 2004; Ziegenspeck *et al*., 2004; Barli *et al*., 2006; De Jong *et al*., 2006; Salka *et al*., 2006; Sanginga *et al*., 2006; Schlüter, 2007; Bravo and De Moor, 2008; Short, 2008).

Developing and enhancing integrated models for common land management is an essential strategy for the development of rural communities and the revitalization of rural areas. Yet, managing communal forests is difficult insofar as collective private ownership involves very complex processes of spatial concentration, association and social participation (Aasetre, 2006; Matta and Alavalapati, 2006; Montiel, 2007; Tucker *et al*., 2007) that may lead to passive attitudes toward forest management (Pinto-Correia, 2000; Schlueter, 2008) or to conflict situations (Buchy and Hoverman, 2000; Skutsh, 2000; Bogale *et al*., 2006; De Jong *et al*., 2006; Matta and Alavalapati, 2006; Brehm, 2007; Siiskonen, 2007).

Communal forests, named Montes Veciñais en Man Común (MVMC), are a characteristic form of communal land in Galicia (Marey-Perez *et al*., 2005; Balboa *et al*., 2006; Fernández *et al*., 2006). Figure 1 shows the location of Galicia in Spain and in the European Union, as well as the distribution of MVMC across the region. Most MVMC are concentrated in Southern and Eastern Galicia. Communal forests are collectively and privately owned by rural communities made up of groups of neighbours who own economic units, are owners of a house and have their usual place of residence in the locations to which the exploitation of the forests has been traditionally assigned, and have been carrying out some activity related to communal forests according to the common practice of their community. Communal forests account for about 1/3 of total forest land in Galicia, which amounts to 660,000 ha. The average size of MVMC is 230 ha, largely exceeding the average size

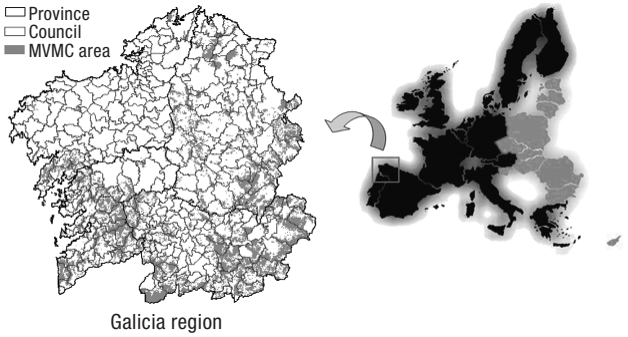

Figure 1. Location of Galicia and of Galician forest communities (MVMC).

of parcels that belong to individual private owners (1.5-2 ha/owner) (Xunta de Galicia, 2001). However, the non-wooded land area is substantially higher in MVMC (Marey-Pérez *et al*., 2006; Marey-Pérez and Rodríguez-Vicente, 2008).

The growing demographic decline in rural areas and particularly in inner areas of Galicia has led to an increasingly limited use of common resources (Fandiño *et al*., 2006; González *et al*., 2007; Riveiro *et al*., 2007). Today, given the production potential of Galicia in terms of agriculture, forestry and new energy sources, MVMC are one of the challenges for the future socioeconomic regeneration of rural areas.

MVMC are often defined as a heritage resource to which rational models of sustainable forest management and rural development policies can be applied (Marey-Pérez *et al*., 2006). Yet, the implementation of such policies lacks an analytical tool to assess the different possible scenarios for common land management. Many authors have been concerned with MVMC (Bouhier, 1979; Fernández Leiceaga, 1990; Rico Boquete, 1995; Balboa, 1996; Balboa *et al*., 2006), mainly with historical and legal aspects, but MVMC have rarely been analyzed from a social perspective.

The analysis of mass media has been used to determine the social impact of natural resource management (Xu and Bengston, 1997; Okhura, 2003; Wakefield and Elliot, 2003; Hovardas and Korfiatis, 2008). More specifically, the perception of forest communities by media is an indicator of the level of management and organization of communities (Aasetre, 2006), which is particularly useful in the analysis and assessment of the social relevance of forest communities in the study area and of the interactions of social relevance with economic and environmental issues (Gómez-Vázquez *et al*., 2009).

The objective of this paper is to gain a deeper insight into the level of conflicts of MVMC by analyzing the presence in local and regional mass media of the factors that participate in the process, namely sociological factors (composition and level of organization and participation of forest communities), environmental factors (determination of rationality in the use of management resources and systems and their sustainability), and economic factors.

Methods

Data search

From 2002, digital mass media became widely available in the study area. Data were collected between 30th June 2002 and 31st March 2008. All the newspaper reports related to MVMC found in the digital libraries of national newspapers with a regional edition for Galicia (2), regional newspapers (1), or provincial and local newspapers (15) were collected and analyzed.

A database was created to classify the newspaper reports into different groups according to social issues (participation in the community, training and employment, conflicts, cultural activities and membership in an association or cooperative), environmental issues (forest fires, site contamination, degradation of natural resources, promotion of good management practices, fines and sanctions for poor environmental practices) and economic issues (public subsidies, traditional and innovative production activities, management reports, resource concessions and agreements).

Yet, further data were required for the analysis. Following a process of data homogenization and validation, official statistics pertaining to land-use structure and socioeconomic variables were collected (Niskanen and Lin, 2001) from the following sources: i) the Spanish Statistical Office (INE, 2008) provided data pertaining to social and economic development (data related to population density, structure and occupation, among others); ii) the Forest Map of Spain, developed by the Spanish Ministry of the Environment (MMA, 2009), provided land use data (wooded and non-wooded land area, agricultural land area or idle land, among others); iii) a census of Galician Forest Communities (Xunta de Galicia, 2008; unpublished document), which provides data of the village, parish, municipality and province where each forest community belongs; and finally, iv) other research works or studies were reviewed (Díaz Fuentes, 1999; Prada, 2001; Soliño, 2003; Balboa *et al*., 2006) in order to

verify that the source of information used in our research completed the information provided by similar sources, thus validating the reliability of the source and assessing the significance of its contribution.

Data processing

After the input data were obtained, a tool was developed to analyze the information collected (White *et al*., 2009). Such a tool was a database that included all the manifestations related to forest communities published in the media, classified according to a number of indicators.

Then, the indicators for analysis were defined and grouped into three categories: social, environmental and economic indicators. Generally, society, environment and economy are the three pillars of sustainability (Atmis *et al*., 2007; Montiel, 2007). A legend was defined for the indicators analyzed in this paper, as shown in Table 1. Social indicators comprise most of the indicators and pertain to community participation, generation of employment, relationships within and between the communities, and conflicts with external actors. Environmental indicators are related to positive and negative actions in common land. Economic indicators are associated with the economic sustainability of forests and communities of forest owners, and with monetary exchanges.

Analysis methods

A database was developed to relate the types of conflict (analysis variables) to the different forest communities (elements of analysis). The output was a news count for every forest community and indicator. Two types of analysis were used. First, spatial analysis was performed using commercial geographic information systems (GIS) to detect changes in the spatial dynamics of the distribution of the different types of management across Galician Forest Communities. By using commercial GIS, the news database was linked to geographic information pertaining to every MVMC, and completed with the socioeconomic and physical variables obtained from the initial inventory.

Table 1. Summary of the descriptive analysis of the indicators

Code	Category	Type of conflicts	No. of cases	Total % of parishes with reports	Sum of reports	% of the total sum of reports	Arithmetic mean
110	Social	Social participation	175	10.1	463	9.64	0.27
120		Training and employment	136	7.86	209	4.35	0.12
131		Conflicts. Within the community	63	3.63	203	4.23	0.12
132		Conflicts. Between communities	104	6.00	219	4.56	0.13
133		Conflicts. Institutional	182	10.5	602	12.54	0.35
134		Conflicts. Concessions	107	6.2	229	4.77	0.13
135		Conflicts. Other Stakeholders	57	3.3	109	2.27	0.06
140		Traditional and cultural activities	66	3.81	127	2.64	0.07
150		Groups of owners	66	3.81	128	2.67	0.07
210	Environmental	Environmental disasters	207	11.96	395	8.23	0.38
220		Promotion of good practices	202	11.67	427	8.89	0.25
230		Promotion of activities with environmental content	184	10.63	384	8.00	0.22
240		Complaints about bad practices	117	6.76	259	5.39	0.15
310	Economic	Subsidies granted or requested	172	9.93	295	6.14	0.17
320		Innovative production activities	75	4.33	114	2.37	0.07
330		Economic profit or economic activity report	159	9.19	327	6.81	0.19
340		Resource concession or cooperation agreements	147	8.49	312	6.50	0.18
		Total reports	741	42.81	4,802	100.00	2.77

The spatial units of analysis were the parishes to which the forest communities belonged. The following information was available for every group of MVMC belonging to a given parish: alphanumeric information, social data, structural data, land use data and number of news.

Second, a specific statistical methodology based on multivariate analysis was developed. The goals of the methodology are: 1) to explain whether conflicts are randomly distributed or grouped into different classes, and 2) to determine the sources of conflicts and whether there is a distinct pattern for the presence of conflicts in each area that can be totally or partially explained based on other social, economic or environmental variables. The development of the methodology was divided into the following stages: 1) Correlation analysis was used to find the degree of suitability of the variables for the analysis proposed (Barli *et al*., 2006), Spearman's rho was used to estimate the statistical association between variables at 0.05 and 0.01 significance levels. 2) Classification of a set of elements. 3) Grouping of the different elements into homogeneous units. 4) Verification of actual differences between groups (Cao, 2002; Marey-Pérez, 2003) based on Principal Components Analysis (PCA) and Cluster Analysis (Niskanen and Lin, 2001; Purnono *et al*., 2005). The Ward Method of Clustering was used to this end (Escribano *et al*., 2006). 5) Analysis of variance (ANOVA) (Dean and Voss, 1999; Arriaza *et al*., 2008). In the analysis of variance, the groups obtained from Cluster analysis were compared. For that purpose, a Fisher F-test was performed in order to spot the differences. When more than two groups were compared and significant differences were found, post-hoc analyses were carried out in order to determine between which groups the significant differences were occurring (Hair *et al*., 1999). The post-hoc Tukey's HSD test was used to regroup ordinal variables into homogeneous subgroups based on a similar statistical behaviour of the continuous study variables.

After having defined every group, the relationships between each group and the social, economic and land-use structure variables considered were explored. The following variables were used to characterize the groups: evolution of population density 1960-2006 (people km^{-2}), percentage of population over 65 years, percentage of population engaged in agriculture, percentage of agricultural land area, and percentage of forested area planted with fast-growing species.

All the statistical analyses were conducted by using R software, version 2.5.2.

Results

All the manifestations related to Galician forest communities published in local, provincial and regional newspapers during the last five years and included in data processing were counted. Yet, not all the forest communities are mentioned in local newspaper reports in the last five years. To be more specific, the newspaper reports analyzed in this paper contain manifestations related to conflicts over common land for 31% of the forest communities, distributed over 741 parishes. Galicia is made up of 3,793 parishes, 1,731 of which have some forest community. Therefore, 42.8% of the parishes with MVMC have generated some newspaper reports. With regard to the recurrence of reports for the same location, the maximum number of newspaper reports per parish was 145 when all the indicators were considered. Table 1 summarizes the arithmetic mean of newspaper reports published considering all the parishes with MVMC, regardless of whether or not the articles referred to them, and the number of cases (parishes) that generated some newspaper reports for each indicator. The number of newspaper reports compiled was 4,802, 28.3% of which were related to conflicts, mainly with institutions. Other frequently cited indicators were, in order of frequency: social participation, promotion of good environmental practices, environmental disasters and promotion of activities with environmental content.

The map in Figure 2 illustrates the areas where the analyzed newspaper reports occurred and the number of newspaper reports compiled for each area. The map reveals a strong concentration of conflicts in the westernmost areas of Galicia. Such a spatial pattern is common to all the indicators considered.

The correlation analysis produces high Spearman's rho values: the positive and significant correlations found between all the indicators at 0.01 significance level confirms the presence of a common spatial pattern, *i.e.* all the newspaper reports refer to the same locations, regardless of the indicator considered in the report. Table 2 summarizes the results of correlation analysis. The strongest correlation is found between «Participation (110)», «Conflicts with Institutions (133)» and «Conflicts over concessions (134)»; «Participation (110)» and «Promotion of activities with environmental content (230)»; and «Participation (110)», «Subsidies granted and requested (310)» and «Concessions and cooperation agreements (340)».

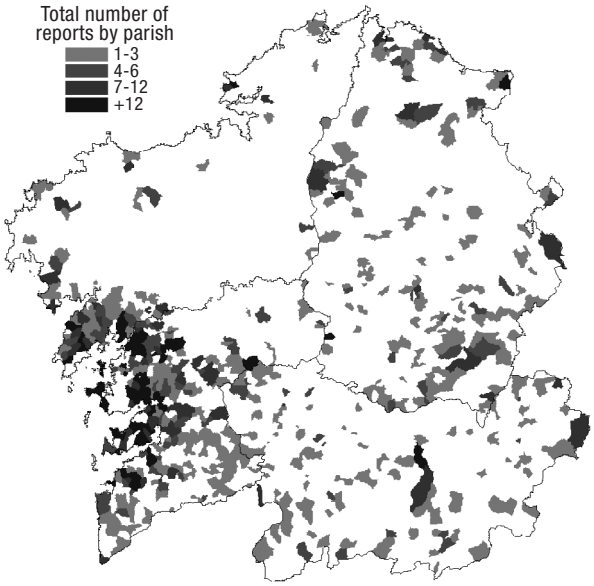

Figure 2. Location of newspaper reports by parish.

Initially, the number of groups to be used in the cluster was not defined. The number of clusters was assigned by looking at the dendrogram and choosing the point that enabled the user to define clusters or homogeneous branches (Table 3).

Group 2 comprises all the parishes that did not generate any newspaper report or that generated only a few newspaper reports. Differences were found for the rest of groups. Table 4 shows the mean values for every indicator and group. Group 1 is strongly correlated with institutional conflicts, which suggests that the communities in Group 1 are defined as active, participative and revolutionary. Group 2 does not show strong correlations with any of the indicators. The parishes included in Group 2 are passive and do not generate any activity in their forests or, at least, the media do not reflect any activity in their forests. Such parishes can be defined as inactive communities or as communities with a very low degree of activity. Group 3 comprises a smaller number of parishes, only 50, and is strongly correlated with the following indicators: training and employment, promotion of good practices and promotion of environmental activities. The forest communities in Group 3 are active communities, with important economic and environmental values but with some level of abandonment. Group 4 is composed of 100 parishes that are strongly correlated with indicators of participation, natural disasters and good environmental practices. The parishes in Group 4 are economically profitable and have an acceptable level of participation, but show considerable environmental risks associated with forest fires. Finally, Group 5 comprises 159 parishes. The results for Group 5 suggest a balance between participation, conflicts with institutions, environmental disasters, promotion of good practices and environmental activities. The communities in group 5 can be defined as communities close to achieving social, environmental and economic equilibrium.

Figure 3 shows the geographical distribution of the groups resulting from the Ward Method of clustering. An ANOVA test was performed to validate the classification. Table 5 summarizes the validation results, which reveal differences at 0.05 significance level, except for three of the 17 variables used, *Traditional and cultural activities* (0.136), *Groups of owners* (0.254) and *Innovative production activities* (0.606). A 0.000 level of significance was obtained for the other 14 indicators, which confirms the differences between the groups obtained from clustering. Hence, the null hypothesis that the means are the same for every group must be rejected. Accordingly, it has been assumed that there are significant differences between the homogeneous groups defined by the Ward method for the different Indicators.

As suggested in the Methods section, post-hoc tests allowed us to spot the differences for every indicator. If no differences were found, the validity of our methodology would be questioned.

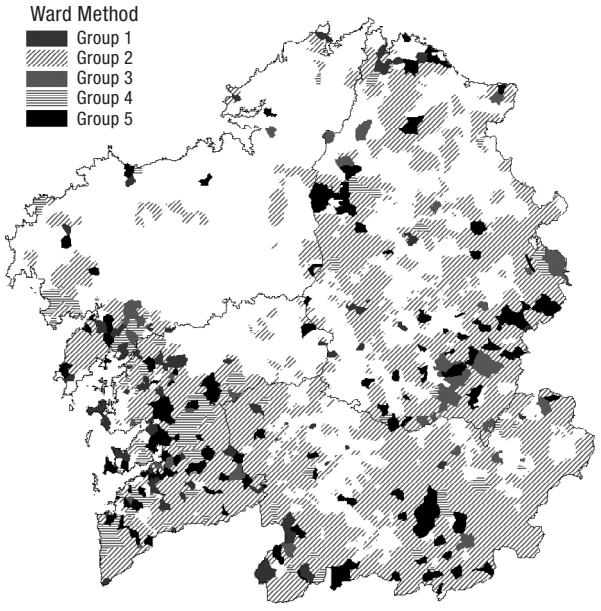

Figure 3. Location of the groups resulting from the Ward method of clustering.

Table 2. Correlation analysis

Indicator	110	120	131	132	133	134	135	140	150	210	220	230	240	310	320	330	340
110																	
120	0.292 (**)																
131	0.546 (**)	0.035															
132	0.320 (**)	0.111 (**)	0.178 (**)														
133	0.575 (**)	0.175 (**)	0.485 (**)	0.244 (**)													
134	0.273 (**)	0.091 (**)	0.240 (**)	0.097 (**)	0.485 (**)												
135	0.363 (**)	0.080 (**)	0.312 (**)	0.227 (**)	0.327 (**)	0.152 (**)											
140	0.162 (**)	0.208 (**)	-0.009	0.105 (**)	0.050 (*)	0.022	0.070 (**)										
150	0.057 (*)	0.165 (**)	-0.004	0.035	0.062 (**)	0.050 (*)	0.270 (**)	0.022									
210	0.422 (**)	0.306 (**)	0.136 (**)	0.237 (**)	0.246 (**)	0.131 (**)	0.135 (**)	0.110 (**)	0.145 (**)								
220	0.580 (**)	0.329 (**)	0.352 (**)	0.22) (**)	0.399 (**)	0.149 (**)	0.267 (**)	0.105 (**)	0.139 (**)	0.597 (**)							
230	0.686 (**)	0.334 (**)	0.365 (**)	0.446 (**)	0.558 (**)	0.208 (**)	0.413 (**)	0.162 (**)	0.052 (*)	0.414 (**)	0.482 (**)						
240	0.370 (**)	0.161 (**)	0.306 (**)	0.148 (**)	0.428 (**)	0.183 (**)	0.213 (**)	0.123 (**)	0.012	0.160 (**)	0.308 (**)	0.378 (**)					
310	0.507 (**)	0.305 (**)	0.205 (**)	0.316 (**)	0.317 (**)	0.093 (**)	0.274 (**)	0.133 (**)	0.164 (**)	0.500 (**)	0.485 (**)	0.519 (**)	0.230 (**)				
320	0.111 (**)	0.178 (**)	0.047	0.035	0.046	0.007	0.075 (**)	0.056 (*)	0.054 (*)	0.139 (**)	0.143 (**)	0.071 (**)	0.057 (*)	0.156 (**)			
330	0.341 (**)	0.158 (**)	0.272 (**)	0.229 (**)	0.301 (**)	0.263 (**)	0.179 (**)	0.161 (**)	0.052 (*)	0.410 (**)	0.402 (**)	0.346 (**)	0.292 (**)	0.279 (**)	0.144 (**)		
340	0.509 (**)	0.224 (**)	0.308 (**)	0.259 (**)	0.536 (**)	0.338 (**)	0.255 (**)	0.091 (**)	0.077 (**)	0.364 (**)	0.370 (**)	0.458 (**)	0.310 (**)	0.261 (**)	0.130 (**)	0.400 (**)	

* Correlation is significant at 0.05 level (two-tailed). ** Correlation is significant at 0.01 level (two tailed).

Table 6 shows the classification of the subgroups that resulted from clustering for the most relevant indicators. Clustering was performed using the post-hoc Tukey's HSD test, based on the similarities among the arithmetic means of the subgroups.

For the «Participation» indicator, three subgroups obtained very similar within-group mean values and differing between-group mean values. For example, Groups 4 and 5 are included in subgroup 2, with arithmetic means that are not significantly different (Sig. = 0.998). Subgroup 3 comprises only Group 1.

For the «Conflicts. Institutions» indicator, two subgroups are defined: the first subgroup comprises four groups with no significant differences (sign. > 0.05), and the second subgroup includes only one group, whose mean is significantly higher than the means of the rest of groups.

A different example is provided by the «Promotion of good practices» indicator. For this indicator, four subgroups are obtained, which implies larger differences between groups.

The following results have been obtained from the contrast of socioeconomic and land-use structure indicators. The ANOVA test (Table 7), with a critical level of F below 0.05, reveals differences between groups for the following variables: evolution of population

Table 3. Results from cluster analysis (Ward method)

Ward method	Frequency	Percentage
1	78	4.5
2	1,344	77.6
3	50	2.9
4	100	5.8
5	159	9.2
Total	1,731	100.0

density, percent population over 65 years, percent population engaged in agriculture and percent forested area planted with fast-growing species. However, no differences are found for the variable «percent agricultural land area».

Boxplots help understand the behaviour of each variable included in the five groups obtained from Cluster analysis. With regard to the evolution of population density, the boxplot (Fig. 4a) reveals that the most passive communities, which correspond to communities that did not produce any news suggesting active management or actions in their forests in the analyzed media, are located in areas with a strongly negative population density growth. Groups 1 and 4 correspond to the most conflictive locations because of the presence of conflicts with institutions or environmental conflicts such as forest fires. Such locations correspond to the areas with the highest number of conflicts with the administration or with presence of forest fires, and show positive population density growth. The situation of Group 5 is balanced as compared to the characteristics of the other groups.

The variable «percent population over 65 years» is inversely correlated with the level of participation and conflict, such that the least ageing communities are the most active communities but also the communities with a higher level of conflict, as shown in Figure 4b.

The same applies to the variable «percent population engaged in agriculture» (Fig. 4c). A higher percent population engaged in agriculture does not involve more activity in the MVMC of the area. Figure 4c suggests that the most active communities are located in areas where the economic activity is focused on industries different from agriculture.

Figure 4d represents the differences between groups for the variable «percent forested area planted with fast-growing species». Because one of the main characteristics of Group 4 is the high percent of «economic profit or economic activity report», Group 4 must be the group with the largest percent forested area. Group 5 shows a high percent forested area planted with fast-growing species. Conversely, Group 2 includes communities with a high level of abandonment and a low percent forested area, and Group 1 is characterized by a large number of «Resource concessions and cooperation agreements». Therefore, the areas included in Groups 1 and 2 replace forest production with non-forest land uses, such as energy, mining or industrial estates.

Table 4. Mean value for each cluster

Indicator		Ward method					
		1	2	3	4	5	Total
110.	Participation	1.73	0.07	0.10	0.94	0.88	0.27
120.	Training and employment	0.26	0.04	1.66	0.29	0.18	0.12
131.	Conflicts. Within the community	1.18	0.07	0.02	0.16	0.03	0.12
132.	Conflicts. Between communities	0.42	0.11	0.08	0.11	0.13	0.13
133.	Conflicts. Institutional	5.04	0.07	0.06	0.61	0.28	0.35
134.	Conflicts. Concessions	1.01	0.09	0.02	0.15	0.05	0.13
135.	Conflicts. Other Stakeholders	0.24	0.06	0.06	0.03	0.06	0.06
140.	Traditional and cultural activities	0.14	0.06	0.06	0.10	0.14	0.07
150.	Groups of owners	0.13	0.07	0.00	0.15	0.09	0.07
210.	Environmental disasters	0.35	0.06	0.12	2.24	0.39	0.23
220.	Promotion of good practices	0.59	0.08	0.26	1.24	0.89	0.25
230.	Promotion of activities with environmental content	0.97	0.07	0.44	0.67	0.79	0.22
240.	Complaints about bad practices	0.67	0.12	0.04	0.21	0.14	0.15
310.	Subsidies granted or requested	0.51	0.05	0.18	0.38	0.89	0.17
320.	Innovative production activities	0.10	0.06	0.12	0.04	0.06	0.07
330.	Economic profit or economic activity report	0.35	0.15	0.08	0.66	0.16	0.19
340.	Concessions and agreements	0.91	0.13	0.08	0.40	0.14	0.18

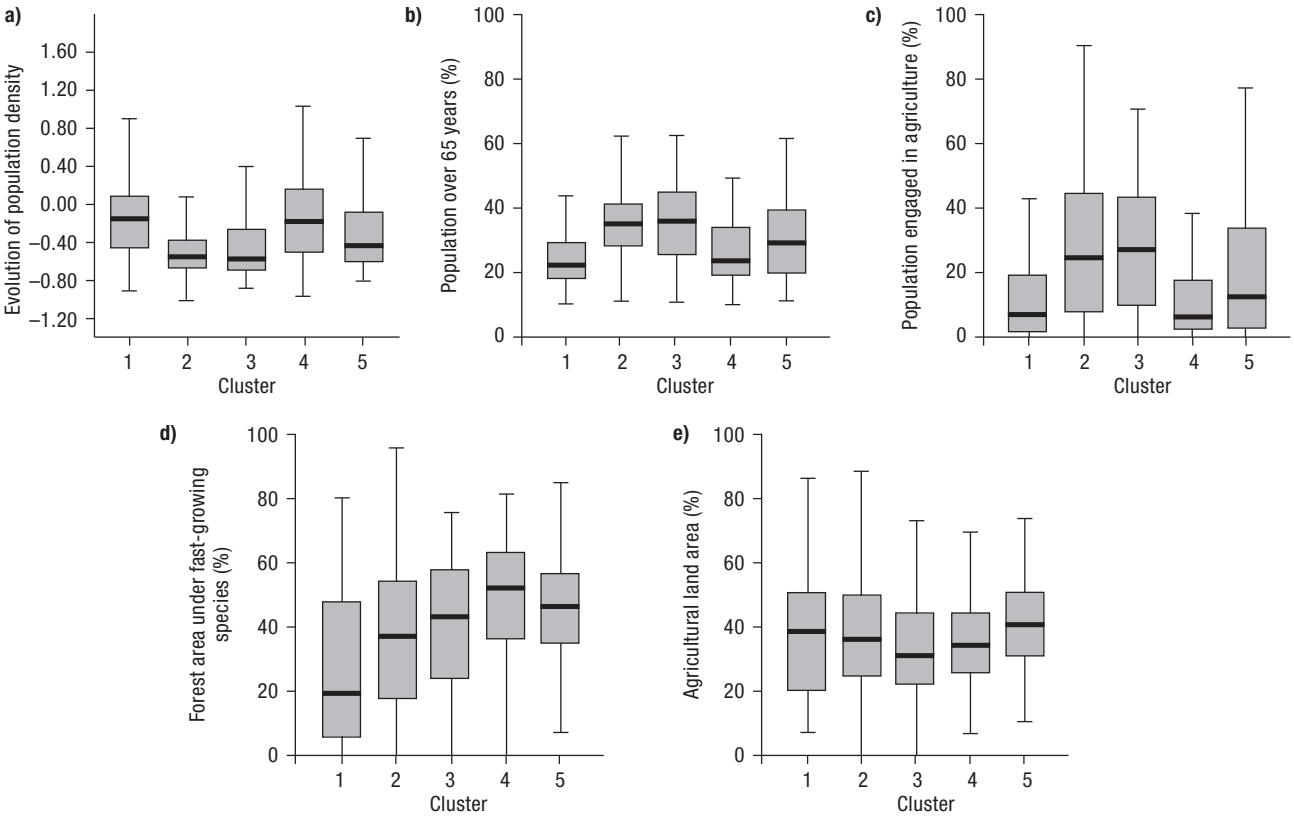

Figure 4. Boxplots for the variables a) «Evolution of population density», b) «Percentage of population over 65 years», c) «Population engaged in agriculture», d) «Percentage of forested area planted under fast-growing species», and e) «Percentage of agricultural land area».

Finally, the structural variable «Percent agricultural land area» (Fig. 4e) does not appear to affect the types of forest communities found. Significant differences are found only between Groups 3 and 5, which suggests that the areas with a high percent population engaged in agriculture do not necessarily show a high percent agricultural land area. In fact, the agricultural activity has ceased in these areas. In addition, some correlation is observed between the forest communities included in group 5 and the most productive agricultural areas.

Discussion

The methodology presented here allowed to analyze the complexity of common forest management practices in Galicia by classifying newspaper reports under different groups of indicators. Such a classification can be performed at large scales and at very low costs, which is not possible using other sources such as surveys to owners (Barli *et al*., 2006; Marey-Pérez and Rodríguez-Vicente, 2008). Moreover, it provides a new perspective on common management, since conflict is perceived from an external point of view that targets the whole society of the region (Meitner *et al*., 2005). Similar approaches were successfully taken elsewhere (Yasmi *et al*., 2006; Hovardas and Korfiatis, 2008) to analyze agricultural and forestry conflicts.

Because the most relevant indicators in terms of number of reports and correlation with other indicators were those pertaining to «conflict» and «participation», both classes were considered as references for the analysis. Accordingly, communities with high levels of social participation were identified as active communities. However, the fact that a forest community was active did not mean that the community was managing resources properly, as suggested by the direct relationship between participation and conflict, *i.e.* social participation generates and triggers conflicts (Skutsh, 2000; Wiesmann *et al*., 2005; Méndez-Contreras and Dickinson, 2008). The most reasonable explanation for such a direct relationship between both factors is that the new uses (mainly, energy sources) are economically interesting to commoners and, as suggested by some

Table 5. Results from ANOVA

Variables	Source of variation	Sum of squares	df	Square mean	F	Sign.
Participation	Between groups	327.837	4	81.959	46.977	0.000
	Within groups	3,011.322	1,726	1.745		
Training and employment	Between groups	133.087	4	33.272	143.325	0.000
	Within groups	400.678	1,726	0.232		
Conflicts. Within the community	Between groups	93.337	4	23.334	26.960	0.000
	Within groups	1,493.856	1,726	0.866		
Conflicts. Between communities	Between groups	7.299	4	1.825	4.338	0.002
	Within groups	725.994	1,726	0.421		
Conflicts. Institutional	Between groups	1,828.321	4	457.080	200.421	0.000
	Within groups	3,936.318	1,726	2.281		
Conflicts. Concessions	Between groups	64.203	4	16.051	30.696	0.000
	Within groups	902.502	1,726	0.523		
Conflicts. Other stakeholders	Between groups	2.729	4	0.682	3.154	0.014
	Within groups	373.407	1,726	0.216		
Traditional and cultural activities	Between groups	1.502	4	0.376	1.751	0.136
	Within groups	370.180	1,726	0.214		
Groups of owners	Between groups	1.244	4	0.311	1.338	0.254
	Within groups	401.291	1,726	0.232		
Environmental disasters	Between groups	450.164	4	112.541	181.419	0.000
	Within groups	1,070.700	1,726	0.620		
Promotion of good practices	Between groups	213.495	4	53.374	70.529	0.000
	Within groups	1,306.173	1,726	0.757		
Promotion of activities with environmental content	Between groups	148.281	4	37.070	37.449	0.000
	Within groups	1,708.534	1,726	0.990		
Complaints about bad practices	Between groups	23.017	4	5.754	7.038	0.000
	Within groups	1,411.230	1,726	0.818		
Subsidies granted or requested	Between groups	116.357	4	29.089	81.723	0.000
	Within groups	614.368	1,726	0.356		
Innovative production activities	Between groups	0.325	4	0.081	0.679	0.606
	Within groups	206.168	1,726	0.119		
Economic profit or economic activity report	Between groups	26.669	4	6.667	8.396	0.000
	Within groups	1,370.558	1,726	0.794		
Concessions and agreements	Between groups	50.543	4	12.636	17.430	0.000
	Within groups	1,251.221	1,726	0.725		

authors, are at the source of many conflicts (Skutsh, 2000), such as conflicts within the community (Brehm, 2007), conflicts with institutions (Pinto-Correia *et al*., 2006; Ibarra and Hirakuri, 2007) or conflicts with concessionaires (De Jong *et al*., 2006). Problems often arise because of the momentary uncertainty of the economic return of MVMC, which increases social participation. Social participation is higher in areas where the main economic activity is not agriculture or forestry, but manufacturing or services.

An important consideration regards the perception of Forest Communities by media. The social environment enhances participation in the areas with the most positive population density growth patterns. Conversely, in the most passive areas, the insignificance of the different communication networks fosters abandonment and lack of interest in common land. Such a key role of social environment in the different approaches taken by media according to the geographical area has been spotted by some authors (Elands *et al*., 2004;

Table 6. Results of Tukey's HSD post-hoc test for variables «Participation», «Conflicts with institutions» and «Promotion of good practices»

Ward method	N	Subgroup for α = 0.05			
		1	2	3	4
«Participation»					
2	1,344	0.07			
3	50	0.10			
5	159		0.88		
4	100		0.94		
1	78			1.73	
Sign.		1.000	0.998	1.000	
«Conflicts with Institutions»					
3	50	0.06			
2	1,344	0.07			
5	159	0.28			
4	100	0.61			
1	78		5.04		
Sig.		0.075	1.000		
«Promotion of good practices»					
2	1,344	0.08			
3	50	0.26	0.26		
1	78		0.59	0.59	
5	159			0.89	
4	100				1.24
Sig.		0.563	0.057	0.098	1.000

The table shows the mean values of homogeneous subgroups for the five groups obtained from clustering.

Hoogstra *et al*., 2004; Ziegenspeck *et al*., 2004; Matta and Alavalapati, 2006).

In addition, our results suggest a strong tendency towards social and environmental aspects, which is in consistency with the results reported by Skutsh (2000) and Elands *et al*. (2004). Although the economic aspects are less important, some activities not related to traditional agricultural and forest land uses are gaining relevance. The main objective of owners or managers is to make profit with the least possible effort, and the easiest way to accomplish this objective is to hand management over to other bodies or institutions through cooperation agreements or through the transfer of the land to undertake non forest economic activities, which involves non-management by owners (Skutsh, 2000). This situation is observed mainly in densely populated areas.

Likewise, cluster analysis reveals marked differences in the level of organization and management modes of the Communities:

The parishes included in Group 1 are characterized by high social participation, which results in many conflicts, mainly with institutions or within the community. Accordingly, Group 1 is defined by indicators of conflict, as suggested by the fact that the arithmetic means of the indicators of conflict are substantially higher than the overall mean. From an economic perspective, Group 1 includes locations with abundant resource concessions and cooperation agreements with enterprises or institutions, which are often at the source of conflicts (De Jong *et al*., 2006). In addition, Group

Table 7. ANOVA results for socioeconomic and land-use structure variables

		Sum of squares	df	Square mean	F	Sign.
Evolution of population density	Between groups	336.609	4	84.152	3.862	0.000
	Within groups	37,604.864	1,726	21.787		
	Total	37,941.473	1,730			
% population engaged in agriculture	Between groups	37,121.735	4	9,280.434	20.430	0.000
	Within groups	781,788.021	1,721	454.264		
	Total	818,909.757	1,725			
% population over 65 years	Between groups	16,153.436	4	4,038.359	34.574	0.000
	Within groups	201,485.147	1,725	116.803		
	Total	217,638.582	1,729			
Forested area planted with fast-growing species (%)	Between groups	34,876.771	4	8,719.193	18.637	0.000
	Within groups	807,035.887	1,725	467.847		
	Total	841,912.658	1,729			
Agricultural land area (%)	Between groups	4,009.817	4	1,002.454	3.021	0.017
	Within groups	572,343.086	1,725	331.793		
	Total	576,352.902	1,729			

1 must have some economic profit or economic activity report, because having an economic interest in an activity involves higher participation.

Group 2 comprises the largest number of parishes and is characterized by low activity levels. The parishes included in Group 2 are rarely or never mentioned in the media.

Group 3 is defined mainly by two characteristics: high «training and employment» levels and community passiveness (low participation levels). The environmental aspects are not particularly relevant in the forest communities included in Group 3. Consequently, such communities are passive communities with high economic potential or natural value. The interest in natural values or economic potential can be enhanced by promoting technical courses or similar measures, such that the communities involved may gain the knowledge required to address forest management.

Group 4 is defined by three characteristics: high frequency of environmental disasters, understood as forest fires; economic profit or economic activity report; and some social participation and conflicts, usually with institutions. Given that the forest communities included in Group 4 have some economic interest, such communities are prone to environmental risks. As suggested by Chas-Amil (2007), Díaz-Balteiro (2007) and Fernandes (2008), forest fires are a consequence of the conflicts detected.

Group 5 is characterized by a break in the positive correlation between «Participation» indicators and «Conflict» indicators. In this group, conflicts are positive insofar as they suggest a change in society or the desire to find a response to such a change (Hafner *et al*., 2003; Parai and Esakin, 2003; Sanginga *et al*., 2006). Among economic indicators, «Subsidies granted and requested» is the most characteristic indicator in terms of its mean values (Table 3), but high values of «Promotion of good environmental practices» and «Promotion of activities with environmental content» are observed. In Group 5, some forest communities are close to a social, environmental and economic equilibrium, which is the goal of sustainable forest management.

The lack of a distribution pattern for the different groups does not imply that the management approach used in a specific forest community does not affect the approaches applied in the nearest communities.

Finally, our discussion of the correlation between the differences found among groups and the social, economic and land-use structure variables considered suggests that there are two main types of MVMC distributed across two geographical areas in Galicia with different social, cultural and economic realities. The evolution of population is the key to such a differentiation: the population density growth observed in some areas brings about an increase in the number of newcomers to rural areas, who introduce new criteria for land management (Konijnendijk, 2000; Hoogstra *et al*., 2004). Conversely, in other areas the loss of population generates a complete lack of interest (Konijnendijk, 2000; Montiel, 2007; Short, 2008).

Consequently, the lack of conflict in these areas is not due to good resource management but to the passive attitude of commoners and the underutilisation of forests (Schlueter, 2008). The occurrence of conflicts is caused by changes in rural societies (Hoogstra *et al*., 2004; Ziegenspeck *et al*., 2004; Barli *et al*., 2006; De Jong *et al*., 2006; Short, 2008), reflected in common land as the attempt to find an equilibrium between human pressures and the capacity to provide natural resources (Bravo and De Moor, 2008).

With the aim to convert MVMC into an important tool for rural development in Galicia, which is one of the roles of MVMC currently, this paper explores a new data source to help characterize both the institutional arrangement and the level of management of communal forests, assuming the risk of going deeper into highly heterogeneous situations that sometimes do and sometimes do not trigger self-organization. Self-organization is applied in a few communities of MVMC owners, but remains unknown for MVMC communities at a regional level.

The approach of media to conflicts over common land is different according to the geographical area in which the MVMC are located. In agreement with the results reported by Hellström (2001) for conflicts in different forest areas of the world, our analysis suggests that conflicts in forestry depend on the social, political, economic and resource characteristics of the society. MVMC management has different repercussions in coastal areas than in inland mountain areas, which are less densely populated. Negative population density growth favours short-term approaches, mainly because the economic return of MVMC substantially increases in ageing communities. The number of years that commoners can wait to recover their investments decreases with increasing age (Gómez-Váquez *et al*., 2009). Moreover, generational succession is not easy because commoners must live in the parish where the MVMC belongs in order to have land use rights (Marey-Perez

et al., 2006). Conversely, positive demographic trends involve a higher occurrence of socioeconomic and environmental conflicts (Van der Ploeg and Roep, 2003).

Our results reveal a weak repercussion of agriculture and forestry in the media and in society, which is in agreement with Pagdee *et al*. (2006). The relatively low number of news reports for the magnitude of our research and, particularly the low diversity of news types reveal two circumstances: a scarce knowledge of agriculture and particularly of the activity of MVMC communities, and a low interest of readers in forest communities.

The characterization of MVMC reveals three main deficiencies of Galician forest communities: 1) Low capacity to form groups of communities or to cooperate with other communities; 2) low level of training of owners and little diffusion of training possibilities; 3) little innovation in the economic activity of communities.

Our results point to a high number of conflicts with public institutions, which generally manage MVMC totally or partially. Likewise, there are a significant number of conflicts between neighbouring communities. Both situations have their origin in the changes in MVMC property and management underwent since 1941, as suggested by the authors in previous research (Marey-Pérez, 2003, 2006; Balboa *et al*., 2006). The solution to these problems lies in changing the legislation in order to fully clarify the rights and duties of the parts involved.

Therefore, the good management of common resources is in equilibrium in areas with stable population. In Galicia, this situation is observed in areas where farming and agriculture are economically relevant and contribute to the settlement of population in rural areas.

This research highlights the importance of further investigating the reasons behind common land abandonment, focusing on social aspects, which are the least known aspects of common property. Accordingly, future research should focus on the development of management and self-organization models based on the characteristics of each MVMC and area to enhance the participation of the actors involved as a driving force for the social, environmental and economic development of MVMC.

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