

Indicators for Alpine Pastures Multifunctional Use. The Case of Estates of the Regional Agricultural and Forestry Services Board of Lombardy**

Michele Corti*, Giovanni Moranda, Stella Agostini

*Dipartimento di Protezione dei Sistemi Agroalimentare e Urbano e Valorizzazione delle Biodiversità,
Università di Milano, Via Celoria 2, 20133 Milano, Italy*

Received: 22 August 2009. Accepted: 21 October 2009.

Abstract

18 Alpine pastures (AP), in the alpine provinces of Lombardy managed by ERSAF (Regional Agricultural and Forestry Services Board of the Lombardy Region) were investigated to understand how to plan their future. In order to assess their potential multifunctional use three macro functions were considered: 1) agricultural economy (dairy and meat products and agritourism services); 2) leisure and education (direct use of the land); 3) public goods conservation and production (rural heritage, social values, landscape and nature). For each macro function several aspects (three to four) were identified. They were evaluated through operational criteria (three to nine) based on quantitative or qualitative estimates, the former based on linear measures the latter on synthetic evaluations by a panel of experts. By summing up operational criteria scores and applying weighting coefficients an index was calculated for each pasture aspect. These indicators were then used for statistical analysis. Clusters and principal components analysis grouped the pastures into categories suitable for various functions (agritourism and/or agricultural production, ecotourism). Furthermore they highlighted weaknesses and opportunities of individual estates. Results show that multifunctional use indicators could help the management planning of AP pertaining to public land .

Key-words: multifunctionality, AP, Lombard Alps, landscape, heritage, tourism.

Introduction

Since the 1990s the increasing constraints on farm income support were addressed by the discourse of multifunctional agriculture (MFA). It was very important from 1999 to 2002, less used thereafter. The MFA concept was used in international policy documents and discussions in the WTO, its use in scientific debate was spurred by the work of OECD.

MFA was largely integrated in the CAP as a tool to legitimize protectionism in the WTO context. The financial support to farmers' income is justified with the positive effects on the rural areas and public goods they provide in favour of the European society (environmental functions, landscape and heritage protection, food security, tourism). This mainstream interpretation of MFA however was very ambiguous

since the CAP support to commodity agriculture and agribusiness often threaten the same issues MFA is supposed to enhance and conserve.

This ambiguity weakens the MFA discourse and in the recent year the European political discourse clearly shifted from MFA to competitiveness and market orientation (Erjavec, 2009). The scientific debate however is continuing in order to shed light on the manifold meanings of MFA (Zander et al., 2007; Renting et al., 2009). The issues related to MFA will still be important as far as "niche" products, farm tourism, landscape and heritage maintenance are concerned (Daugstat et al., 2006).

Permanent grasslands, as far as biodiversity rich semi-natural pastures are concerned, are currently regarded as a resource to preserve due to the many services they provide to the envi-

** Conference paper , 'Ettaro zero' meeting, Milan, 7-8th may 2009.

* Corresponding Author: E-mail address: michele.corti@unimi.it

ronment and society (Gibon, 2005). Recently however they were considered a limiting factor for the development of efficient livestock production systems. Hence the process of both the concentration and specialization of animal farming lead to the decimation of pastures and permanent grasslands.

This process occurred also in the Alps (Gusmeroli, 2002). Here the traditional livestock summering system preserves not only biodiversity resources but also many elements of material and non-material cultural heritage (knowledge, traditions, practices, events) closely related to active farming and “authentic” food (Corti, 2004a). All these values are important for the local identity and the potential for economic development mainly linked to tourism (Agostini, 2008). The appreciation of the tourists for the amenities and services of the Alpine pastures (AP) (Corti et al., 2006) indicates that multifunctional use of AP could provide competitive resources to the local alpine economy in the context of a “tourism of authenticity”.

To exploit this potential however it is necessary: 1) to address the structural and socio-economic constraints affecting the AP systems; 2) to make an inventory of the environmental and cultural resources they help conserve and reproduce regarding active farming (grazing, milk processing, providing agritourism services).

The present research was conducted with the aim of providing a scheme for the collection and

management of information necessary to assess the potential value of multifunctional use of AP. The evaluation of the multifunctional potential of each site and estate could help decision makers to more effectively channel the financial resources for maintaining and improving structural and infrastructural facilities.

Methods

The sample included 18 AP out of a total of 30 owned by the Regione Lombardia. They are managed by the Forestry and Agricultural Services Regional Board (Ente regionale per i servizi agricoli e forestali) ERSAF and are scattered throughout the Lombard alpine provinces (Tab. 1).

The surface area of these estates ranges from 8 to 300 ha and greatly differ in terms of buildings, energy and water supply endowment, and access facilities (only mule tracks or foot paths sometimes). Most of the AP in the sample is used for grazing by dairy cows (or goats) and milk is processed on the site. Several pastures however lack facilities for cheese making and they are exploited with meat sheep flocks. Finally some agritourism services are offered by 4-5 of the AP in the sample.

In order to evaluate the overall potential land use of the AP in the sample we considered three macro functions: 1) agricultural function

Table 1. The AP included in the sample and their location.

	Name	Municipality	Valley	Province
1	Malga Val Gabbia	Berzo inferiore	Grigna (low Camonica V.)	Brescia
2	Malga Stabil Solato e Foppe	Bovegno	Trompia	Brescia
3	Malga Vaia	Bagolino	Caffaro	Brescia
4	Malga Vesta	Valvestino	Vestino	Brescia
5	Malga Rosello	Gianico	Inferno (low Camonica V.)	Brescia
6	Malga Rosellino	Gianico	Inferno (low Camonica V.)	Brescia
7	Alpe Gotta	Pellio	Intelvi	Como
8	Alpe Nava-Comana	Schignano	Intelvi	Como
9	Alpe Piotti	Canzo	Assina	Como
10	Alpe Pallio	Morterone	Taleggio	Lecco
11	Alpe Foppabuona	Introbio	Sassina	Lecco
12	Alpe Legnone	Delebio	Lesina (low Tellina V.)	Sondrio
13	Alpe Culino	Rasura	Gerola (low Tellina V.)	Sondrio
14	Alpe Dosso Cavallo	Gerola alta	Gerola (low Tellina V.)	Sondrio
15	Alpe Pioda Cameraccio	Valmasino	Masino	Sondrio
16	Alpe Boron	Valdidentro	Lia (high Tellina V.)	Sondrio
17	Alpe Azzaredo	Mezzoldo	Brembana	Bergamo
18	Malga Campolungo	Bienno	Camonica	Brescia

(related to farming economy including income from agritourism services); 2) leisure and educational function (related to direct use); 3) environmental-cultural-social function (related to the provision of public goods). For each function different aspects were evaluated:

- agricultural function: buildings and facilities (access by roads or other means like cableways, energy and water supply), pastoral potential (pasture acreage and quality), agritourism services and facilities;
- leisure and educational function: tourism, hiking, sports, education;
- environmental-cultural-social function: heritage, social values, nature.

Information was obtained from a wide range of sources. Indirect information sources included the ERSAF AP management plan, forestry management plans (when available), maps,

booklets, guidebooks (for hikers, bikers, etc.), web sites on leisure, cultural associations, local authorities and tourist boards. Direct information was obtained in situ by observation and photographic reliefs and by interviewing members of the local ERSAF staff, representatives of local hunting associations, and botanists.

The evaluation of each aspect was conducted by examining several operational criteria (3 to 9) such as amenities, services, opportunities, resources and assigning a score for each (0-10). A total of 57 quantitative and qualitative criteria were used (Tab. 2). Scoring for qualitative criteria was based on the response of a small panel of experts (including the authors and ERSAF officials). Selected criteria do not reflect the temporary business management since the pastures are leased to farmers only for a few years. Thus, unlike other authors (Venerus et al.,

Table 2. The operational criteria used to build up indexes.

Aspects	Criteria
Structural endowment	Accesses (road, tracks, cableways), Water supply, Energy supply, Buildings availability, Buildings state of maintenance
Pastoral potential	Total surfaces, Quality classes, Steepness, Altimetric gradient
Agritourism	Public access, Service access, Energy supply, Water supply, Accommodation, Meals, Educational services, Potential development
Tourism	Access to the pasture, Value as trip destination (as affected by the presence of other pastures nearby), Length of grazing and leisure activities season, Recurring events, Accessibility to down in the valley villages (DVV) by car from urban areas, Accessibility to DVV by train or bus from urban areas, Tourist accommodations in DVV, in the nearby pasture (alpine huts, agritourism, mountain hotels).
Hiking	Variety of access by foot paths, Importance as a day stop along trekking itineraries, Features of main foot path and time to cover the distance, Heritage/Nature/Scenic interest of access to the foot paths, Foot path network length, Mountain tops, lakes, and other features of interest.
Sports	Mountain bike, Mountaineering and bouldering, Other sports (fishing, hunting, paragliding, equestrian).
Education	Facilities, Services, Potential development according to existing facilities
Heritage	Material witnesses (MW) of old pastoral activities, MW of old historic routes, Religious MW, Military MW, Historical facts, Historical ties between individual pasture and cheese type.
Social values	Use of buildings and facilities by local social organizations, Symbolic values for the community, Rural festivals and other social events, Promotion of the local tourist image in weak tourist areas.
Landscapes	Landscape quality (LQ) of the main buildings, LQ of main buildings surrounding artefacts, LQ of other buildings and artefacts scattered over the pasture, LQ of pasture vegetation, LQ of tracks, LQ terrain morphology, value of pastures as observation point.
Nature	Flora and vegetation (endemisms, monument trees, variety), Fauna (endangered species, variety, abundance), Geomorphology and paleontological elements, hydrologic elements (waterfalls, lakes).

2007) we did not consider the number and kind of livestock, grazing, milking techniques, etc.

To calculate indicators for each functional aspect each criterion score was multiplied by weighting factors ranging from 5 to 40. An index for each AP and 11 functional aspects were finally obtained by summing weighted criterion scores.

The above indexes were used in statistical analysis (correlation matrix, cluster analysis and principal component analysis). The JMP application (Sas Inst.) was used for all the analysis.

Results

Correlations between indicators. The Table 3 shows a strong correlation among the structural/infrastructural aspect and leisure/educational functions. The pastoral potential reflects the total surface of the pasture in addition to its quality. It is correlated to the heritage aspect but not to environmental aspects as one might expect. The landscape aspect emerges as a distinct aspect without any correlation with others. This observation along with the negative correlation between the sports and hiking aspects, both pertaining to the leisure function, indicates that an analytical approach to the multifunctional use of pastures must be based on a wide range of aspects.

Quite surprisingly we could not find any correlation between the potential pastoral aspect and the availability of structural and infrastructural facilities. This may raise concern as it means that some pastures lack adequate faci-

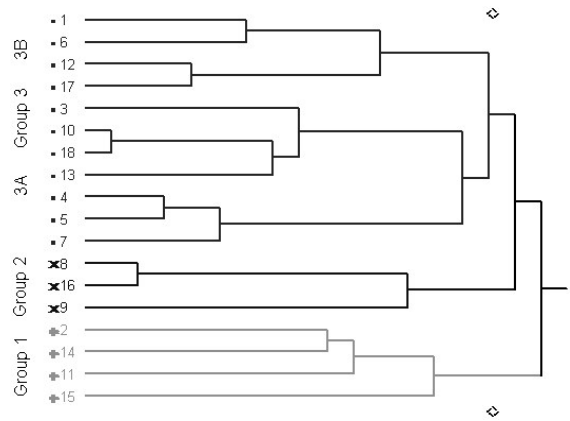


Figure 1. Dendrogram.

ties whereas some other have structural and infrastructural endowments largely exceeding the agricultural potential with unjustified high maintenance costs.

Cluster analysis. Cluster hierarchical analysis (Ward's method) allowed us to divide the sample into 3 groups. The first group (Fig. 1) includes pastures that are connected only by foot-paths or mule tracks without adequate buildings, water and energy supply facilities (2, 11, 14, 15). The second group, by contrast, includes 3 pastures (8, 9, 16) with structures exceeding the need for small size pastures, easy accessibility and good potential for agritourism. The third group includes pastures (1, 6, 12, 17) connected only by mule trails but, unlike the first group, offer several elements of attraction. The other pastures of this group are accessible only by 4-wheel drive vehicles but have other types of facilities.

Principal component analysis. The first two

Table 3. The correlation matrix*.

Aspects	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Structural endowment (1)	1,00	-0,16	0,77	0,41	-0,25	0,60	0,61	0,13	0,30	-0,08	0,14
Pastoral potential (2)		1,00	-0,15	-0,32	0,14	-0,21	-0,03	0,50	0,24	0,18	0,02
Agritourism (3)			1,00	0,70	-0,36	0,71	0,61	-0,02	0,16	-0,13	0,40
Tourism (4)				1,00	-0,25	0,36	0,49	-0,05	0,14	-0,21	0,40
Hiking (5)					1,00	-0,46	0,16	0,35	0,34	0,14	0,11
Sports (6)						1,00	0,46	-0,10	0,03	-0,14	0,08
Education (7)							1,00	0,27	0,50	-0,26	0,43
Heritage (8)								1,00	0,81	0,12	-0,17
Social values (9)									1,00	0,06	0,03
Landscape (10)										1,00	0,04
Nature (11)											1,00

* Correlations values in bold are statistically significant (P < 0.05).

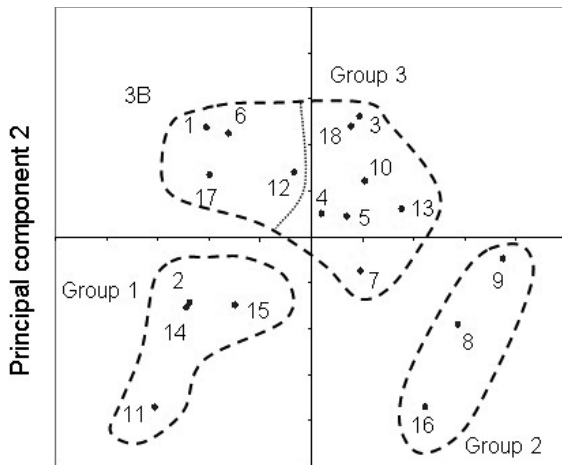


Figure 2. Std principal components coordinates. Principal component 1 = Agritourism/ structural endowment/ education/ tourism/ sports; Principal component 2 = heritage/ social values/ hiking/ pastoral potential.

principal components accounted for only 58% of the variability within the sample but the cumulative percentage was 78% including the fourth component. The principal components analysis however resemble to a large extent cluster analysis (Fig. 2). The first component concerns the following: agritourism, structural endowment, education, tourism, sports; whereas the second deals with the importance of heritage, social values, hiking, pastoral potential. These two components reflect the area suitability: the former requires tourist attractions and a good deal of services and facilities (mostly leisure values), the latter may exploit the niche ecotourism market and is related to public goods. The pastures of the first two principal components were grouped according to 4 possible combinations: positive coordinates for both components (optimal mix of facilities, services, environmental and cultural values), negative coordinates for both components, positive coordinates for the first component and negative for the second one (suitable for agritourism), negative coordinates for the first and positive for the second (suitable for ecotourism).

The aspects that influence the third and fourth components (Fig. 3) do not seem to define two distinct polarities even though they illustrate a great deal of variability. The following aspects emerge: in the third component ‘hiking’ and ‘nature’, in the fourth ‘pastoral potential’ and ‘landscape’.

Discussion and conclusion

The choice of functions is a crucial step in MFA studies. It is not a mere technical matter since it depends on the MFA concept adopted. In public and academic discourse a “narrow” dimension on MFA tends to prevail where only agro-environment and amenity dimensions are considered the social and cultural outputs seen as joint products (Slee, 2007). Multifunctional use of land resources like AP however, implies a greater importance of social and cultural functions compared to intensive farming systems. AP have a very long history; their role was fundamental for the economy and identity of local alpine communities (Corti, 2004b). They maintain symbolic values and are the arena of many rural festivals and social events (Corti, 2000a). Thus we considered several aspects related to social and cultural functions. The choice did not only depend on theory but also on the nature of land ownership: a large public authority interested in implementing public goods related to its forestry and pastoral estates.

Thereafter our approach differs from previous studies on the multifunctional use of AP that focused mainly on environmental (Manara, 2005) or agricultural (Venerus et al., 2007) issues and on leisure activities and tourism.

Apart from the choice of the functions much attention has to be paid also to choosing the aspects pertaining to each function. We observed that aspects within the same function category

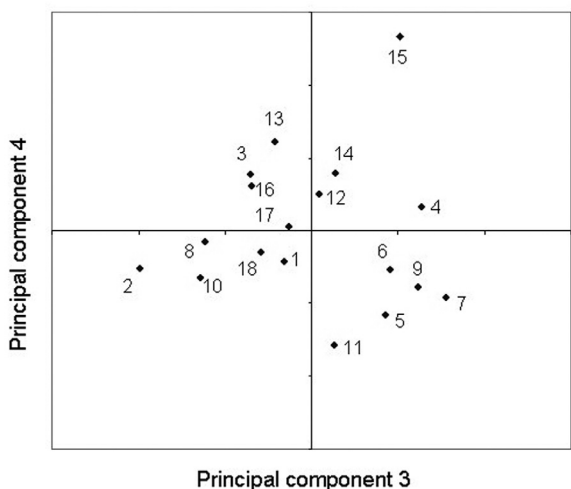


Figure 3. Std principal components coordinates. Principal component: 3 = Nature, Hiking; 4 = Landscape, Pastoral potential.

may be negatively correlated. Thus if only few aspects are considered the discriminating power of the methods could be low.

The lack of correlation between structural endowment and pastoral potential is quite surprisingly a puzzling question. The reason for this may be traced down to the history of the public estates we investigated: they became public lands due to their low economic value and in the context of reforestation plans that transformed at least a portion of the previous pasture into forests.

It should be interesting however to conduct an analogous investigation in the case of the AP owned by the municipalities since they own most of the AP in Lombardy and in the other Italian alpine areas. Decisions about maintenance and improvement of these public estates largely depends on local, temporary circumstances independent from any land use and agro-pastoral planning. A survey carried out by means of a tool such as the one employed in our studies could provide a clear picture of this.

The analytical methods we employed to assess the multifunctional potential use of AP proved to be suitable in order to distinguish and group AP categories .

One of these categories in spite of its low economic potential could be adequate for ecotourism. Strengths and weaknesses of each category were depicted thus enabling decision makers to address in a flexible, efficient way the constraints that prevent better use of the AP in terms of farming economy, territorial economy, public goods maintenance and production.

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