IT3 (Eastern Lowlands of Ferrara, Italy): Landscape perception and ecosystem service uses: some results from surveys and latent factor variable models

Objective

There is a large body of research and application which attributes values to landscape features. Very often, however, it remains questionable to what extent perceived or stated values are actually reflected in behaviour, in particular leading to economic effects on local agriculture. The main objective of this ad hoc study is to investigate the possible relationship between the relevance attributed to some components of agricultural landscape and the behaviour in terms of the use of ecosystem services by the residents and the tourists in the Province of Ferrara (Northern Italy).

Methodology

Data were collected through a telephone survey of 300 residents and 380 tourists in the case study area from July to September 2013. The municipalities were aggregated into three areas based on their geographical location; the aggregation in which respondents were residents was used as one of the three variables of stratification. The other two variables used to stratify the population were gender and age class. Both questionnaires have the same structure even if some questions were adapted to be coherent with the type of respondent (residents or tourists). The objective of the first part of the questionnaire was to collect information about the appreciation of aspects of the agricultural landscape by asking if they could be considered as an advantage or a disadvantage for the agricultural sector. More specifically, the elements can be classified in two groups:

a) Six strictly landscape-based elements: canals and bodies of water (lakes, ponds); herons, other fowl, aquatic animals; woods and characteristic plants, hedges, wetlands and other uncultivated land; rice paddies and related fauna (amphibians, insects, etc.); protected areas in the Po Delta Park; networks of bicycle paths;
b) Three promotional landscape activities: wine and flavour routes ('Strade dei vini e dei sapori'); crops and quality local products (PGI, PDO, DOCG); celebrations and local countryside festivals.

The second part focuses on "uses" of agricultural landscape services, in particular asking about four local product purchases (rice, wine, eels and clams, fruits and vegetables) and six activities connected to rural landscapes (walking, bird watching, cycling, fishing and hunting , visits to the Po Delta Park, dining at agri-tourisms).

The answers obtained regarding the appreciation of aspects of the agricultural landscape and the "uses" of the agricultural landscape services are then used as observed indicators in a latent class factor models; the initial hypothesis is that individual preferences and behaviours depend both on observable characteristics and on latent heterogeneity associated with unobserved factors.

Results

The first question in both questionnaires invited to list the main elements that characterize the agricultural landscape area in the 10 municipalities. The frequency of most cited aspects are presented in Table 1 showing that specific features of the area (intensive agricultural region, wet area as artificial canals, ponds, rivers and coastal zone) are remarked nearly the same by both residents and tourists. Obviously since these areas are mainly the location of a typical vacation along the coast that consists in doing activities on the beaches, the seaside has a higher frequency for tourists.

Table 1. Elements characterizing the agricultural landscape area (first in mind).

Elements	*Frequency of residents (N=300)*	*Frequency of tourists (N=380)*
Agricultural area, crops, fields	59 + 7 Rice paddies	9 + 7 Rice paddies
Woods ,edges, wetlands	52	43
Canals and bodies of water, Po river	45	54
Beaches, seaside	44	130
Urban area	24	16
Herons, aquatic animals	4	9
Protected areas in the Po Delta Park	2	5

For the residents, all the landscape elements are mainly considered as an advantage for agricultural sector (Table 2), but the presence of aquatic animals and of wetlands have the minor percentage. About the "promotional activity" the lowest percentage of an advantage is obtained by the presence of network of bicycle path.

Table 2. Role of landscape elements on agricultural sector (%) for the residents.

Elements	*advantage*	*indifferent*	*disadvantage*
Canals and bodies of water (lakes, ponds)	92.0	3.7	3.0
Herons, other fowl, aquatic animals	50.0	16.7	17.0
Woods and characteristic plants, hedges, wetlands and other uncultivated land	58.7	14.0	17.7
Rice paddies and related fauna (amphibians, insects, etc.)	64.0	11.0	15.7
Protected areas in the Po Delta Park	69.0	10.3	8.0
Networks of bicycle paths	58.7	22.7	8.7
Wine and flavour routes ('Strade dei vini e dei sapori')	74.7	7.3	1.3
Crops and quality local products (PGI, PDO, DOCG)	88.0	1.7	2.0
Celebrations and local countryside festivals	91.7	3.7	2.0

For the tourists, we kept the same structure of the residents' questions, but some adaptations were necessarily needed. In particular, we asked about the influence of landscape elements on the decision to spend vacation in the area. The set of elements includes all the previous ones ("strictly" landscape elements and "promotional" landscape elements) and add some aspects more related to the holiday issues: beaches/seaside infrastructures; lower prices/cost; celebrations and local countryside festivals; knowledge of, and ties with, the territory. The main" attractiveness" were beaches/seaside infrastructures and knowledge of, and ties with, the territory; the less one was rice paddies & related fauna. All the "strictly" landscape elements show a small influence (Table 3).

Table 3. Influence of landscape elements on decision to spend vacation in the area (%).

Elements	*very much*	*somewhat*	*not very much*	*not at all don't*
Canals and bodies of water (lakes, ponds)	16.1	28.2	24.2	22.1
Herons, other fowl, aquatic animals	17.1	33.9	24.2	15.3
Woods and characteristic plants, hedges, wetlands and other uncultivated land	15.8	29.5	25.5	18.9
Rice paddies & related fauna (amphibians, insects, etc.)	5.3	13.7	35.5	35.0
Protected areas in the Po Delta Park	26.1	33.2	21.1	11.1
Networks of bicycle paths	15.8	28.2	25.3	21.8
Wine and flavour routes ('Strade dei vini e dei sapori')	12.1	29.2	25.0	21.3
Crops and quality local products (PGI, PDO, DOCG)	17.6	30.0	26.3	13.7
Beaches / Seaside infrastructures	48.9	30.8	8.4	6.1

Lower prices/cost	19.5	30.8	23.2	16.8
Celebrations and local countryside festivals	13.2	32.1	27.1	17.6
Knowledge of, and ties with, the territory	32.1	32.1	16.3	9.5

The second part of the questionnaire focuses on "uses" of landscape services (recreational activities and purchases of local agricultural products). For residents some recreational activities have a very low (less than once in a month or never) incidence. That is quite justifiable for specific activities for example bird watching or fishing/hunting, but it is more unexpected for "dining in rural guest houses ('agriturismo')" and for "visit to Po Delta Park" (Table 4). Table 5 illustrates purchases frequency of local products: wine is the less often bought, followed by rice.

Table 4. Recreational activities in rural areas by residents in 2013 (%).

Activity	*Several times in a week*	*Once or twice in a week*	*Once or twice in a month*	*Less than once in a month*	*Never*
Walking	27.0	26.0	16.0	12.3	18.7
Bird watching (observation and study of birds and fowl in natural setting)	1.3	1.7	7.3	10.3	78.7
Cycling	33.7	27.7	12.7	7.3	18.7
Fishing in canals or other water bodies (not in the sea) or hunting	2.3	4.3	4.0	4.3	84.0
Dining in rural guest houses ('agriturismo')	1.0	2.7	19.0	35.7	41.3
Visit to Po Delta Park	1.7	0.7	6.7	34.0	56.0

Table 5. Purchase frequency of local products by residents (%).

	Rice	*Wine*	*Eel and/or clams*	*Fruit and/or vegetables*
Always	17.3	8.3	20.7	35.3
Often	23.7	16.3	37.3	43.3
Occasionally	24.0	18.3	29.0	13.7
Rarely	15.3	15.3	6.7	4.3
Never	16.7	40.3	6.0	2.7

For tourists quite high percentage of none recreational activity was registered. The only two activities with a significant frequency are walking and cycling. (Table 6) and purchase of local products during the vacation are likely for eel/clams and fruit/vegetables, but not for rice and wine (Table 7).

Table 6. Recreational activities in rural areas or in the Po Delta park during the vacation (%).

Activity	*often*	*occasionally*	*rarely*	*never*	*will do*
Walking	56.3	25.5	4.2	5.8	1.3
Bird watching (observation and study of birds and fowl in natural setting)	5.5	13.9	13.9	44.5	4.5
Cycling	24.7	25.3	12.6	22.1	3.9
Fishing in canals or other water bodies (not in the sea) or hunting	3.2	5.3	7.4	66.6	1.3
Dining in rural guest houses ('agriturismo')	13.9	20.3	15.5	33.2	4.7
Visit to Po Delta Park	7.4	23.4	15.5	29.5	11.3

Table 7. Purchase possibility local products during the vacation (%).

	Rice	*Wine*	*Eel and/or clams*	*Fruit and/or vegetables*
Without a doubt yes	18.2	22.1	24.2	51.8
Likely Yes	14.7	17.1	19.5	17.1
Likely not	22.1	17.4	13.7	6.6
Without a doubt no	22.1	24.5	21.3	8.7

For residents, a model with four latent ordinal factors was considered. As showed in Figure 1 each of these factors is related to only a subset of the observed indicators (illustrated as rectangle in the figure). In particular, factor 1 (with 2 categories) refers to awareness about the relevance of promotional activities, factor 2 (with 3 categories) accounts for awareness about the relevance of landscape features, factor 3 (with 2 categories) represents attitude to consume local products and factor 4 (with 3 categories) is related to attitude to exploit recreational services related to landscape.

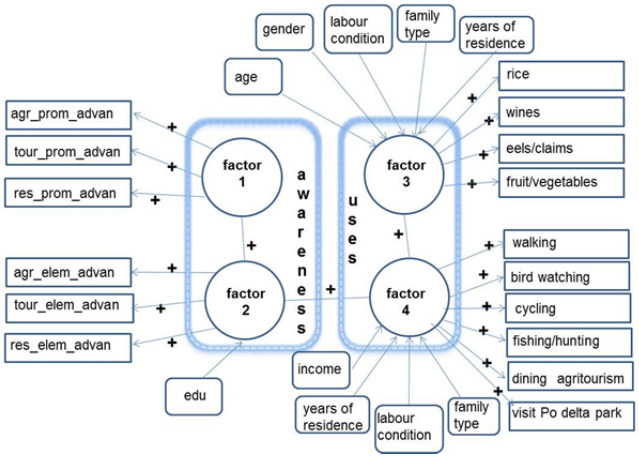

Figure 1. Structure of the model for residents (only significant associations between factors).

For tourists, a latent factor model with five latent ordinal factors was considered. Each of these factors is related to only a subset of the observed indicators. In particular, factor 1 is related to the importance of promotional activities related to landscape in deciding the present holiday destination, factor 2 represents the importance of landscape features in deciding the present holiday destination, factor 3 refers to the attitude to consume local products during the present holiday, factor 4 accounts for the attitude to exploit recreational services related to landscape during the present holiday, and factor 5 is introduced in order to describe the importance of the so-called "seaside-type vacation" (a kind of vacation which is very typical along all the Emilia-Romagna coast, which, broadly speaking, consists in spending most of the holiday doing activities on the beaches) in deciding the present holiday destination. This factor states the tourist attraction for seaside and beaches. Figure 2 summarizes the structure of the final model showing only significant associations between factors and relations between factors and observed variables.

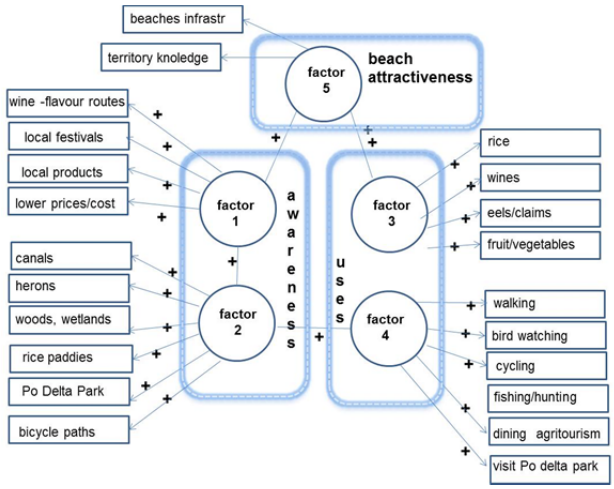

Figure2. Model structure for tourists (only significant associations between factors).

Links connecting agents and causal connections through which landscape can potentially affect rural economies and societies

The two models highlight a significant positive association between the awareness of the relevance attributed to promotional activities relate to landscape and awareness of the relevance attributed to landscape features). Furthermore, both models give some support to the hypothesis that awareness attributed to landscape is positively associated to the attitude to use landscape services: this is confirmed by the significant positive association between factor 2 and factor 4 (awareness of the relevance attributed to landscape features and attitude to exploit recreational services related to

landscape). At the same time, however, it is interesting to note that both models are characterized by the absence of a "direct link" between that awareness/importance attributed to landscape and attitude to consume local products (no significant associations found between factor 1 and factor 3 and between factor 2 and factor 3).

The results validate the presence of a significant association between landscape awareness and ecosystem service uses. However the relevance of these results is mitigated by the low dimension of the groups identified. In fact the results show that only 9% of the residents appreciate landscape elements associated to an high use of landscape services (both recreational activities and local product purchases. This percentage increases to 19% considering the tourist model. This opens the question on choosing the best strategy to exploit the agricultural landscape in order to improve local competiveness, which may involve increase the knowledge on positive landscape aspects, acting on landscape management in order to improve further landscape features, valorise local landscape services towards a wider population.

Lesson learned & Policy Recommendations

In terms of policy implications, the results hint at the importance of awareness and informing residents as a way of making their implicit connections between perception and behaviour more explicit and hence likely encouraging more consistent behaviour. However the main message goes rather in the direction that, in order to valorise landscape elements, it is important to provide anthropic services (in terms of promotional activities and stimulation of recreational activities), that provide some utility per se, but also create synergies with landscape elements. The insight that valorisation of landscape is not solely due to landscape features but rather to human investment also goes helps make more explicit the potential interest in circular flows of financing, connected to the points of profit creation with the provision of the services that can actually attract users.

Responsible partner/person

Meri Raggi[1], Giuliano Galimberti[1], Davide Viaggi[2]
University of Bologna
[1]Department of Statistical Sciences, via delle Belle Arti 41, 40126 Bologna
[2]Department of Agricultural Sciences, Viale Fanin 50, Bologna, Italy