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The Importance of Cultural Ecosystem Services and Biodiversity for Landscape Visitors in the Biosphere Reserve Swabian Alb (Germany)

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Abstract: Agricultural landscapes play an important role in providing different ecosystem services. However, the current trend of land use intensification in Central Europe involves the risk of trade-offs between them. Since cultural ecosystem services (CES) are less tangible, they are often underrepresented in landscape management decisions. To highlight this subject we evaluated CES in agro-ecosystems in the biosphere reserve Swabian Alb (Southwestern Germany). We conducted a survey among visitors to investigate their usage of the landscape, their perception as well as valuation of CES, and interrelations with biodiversity. The results show the presence of various types of usage related to cultural services, the most prominent being recreation and landscape aesthetics. People declared a high affinity to nature and biodiversity awareness. A participatory mapping task revealed their appreciation of biodiverse and ecologically relevant places such as protected species-rich grasslands, traditional orchards and hedgerows. Several socio-demographic differences emerged, e.g., between age classes and local/non-local visitors. We conclude that our exemplary methodical approach was successful in capturing the CES and their link to biodiversity in the investigated biosphere reserve, while identifying priority fields of action concerning the integration of CES into management and planning of cultural landscapes, ultimately serving as guides for local decision-makers.

Keywords: cultural values; biological diversity; evaluation methods; participatory mapping; protected areas; landscape planning

1. Introduction

The benefit of humans from ecosystems is prominently explored under the concept of ecosystem services, which are generally classified into the four categories: provisioning, regulating, supporting, and cultural services [1]. Nowadays, the value of ecosystem services is widely acknowledged and they are increasingly incorporated into (inter-)national regulations, such as the European Union's Biodiversity Strategy to 2020 [2]. However, problems arise when it comes to comprehensive definitions and the assessment of some services. In particular, the cultural services are regarded as controversial and are much debated [3–5].

The Millennium Ecosystem Assessment [1] describes cultural ecosystem services (CES) as "the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences." This classic definition is commonly used but has since also been adjusted, reshaped and extended in many publications. Fish et al. redefined CES as environmental spaces and cultural practices, reinforcing each other and creating cultural benefits for human well-being [5]. The knowledge about and appreciation of this interaction is intended to enable researchers and decision-makers to grasp the cultural significance of ecosystems [5]. However, cultural along with regulating services appear to be the most degraded on a global scale [1], although dependency of and demand for these services is growing especially in industrial countries [6].

CES can greatly influence landowner decisions and guide them towards less economically, but more ecologically driven land use options [7]. For instance, many private forest owners in the Black Forest in southwestern Germany care less about their economic benefits and instead choose close-to-nature management, thus increasing the opportunities for enjoyment of nature experiences [8]. CES are therefore regarded as potential motivators and incentives for people to protect their environment [9–11]. Nonetheless, incorporating them into decision-making is often still lacking [1,11,12], which may be explained by their (misleading) reputation of being non-marketable, non-instrumental, non-use, non-material, non-monetary, non-economical and non-secular commodities [5].

Human influence on ecosystems is particularly evident in agricultural land, which already makes up one fourth of the terrestrial surface [1]. Especially in Europe, these areas harbor a large share of land use and biodiversity, and are additionally important providers of multiple ecosystem services crucial for human life [13]. Well-managed agricultural landscapes encompass not only provisioning services (e.g., food and biofuels), but also regulating (e.g., water and climate regulation), supporting (e.g., soil formation and nutrient cycling) and cultural services (e.g., recreation and cultural heritage) [1,14]. However, biodiversity loss, one of the most pressing environmental challenges today, is especially severe in agricultural settings, negatively affecting ecosystem services as well [1,15].

Traditional, extensive agricultural landscapes are of particular importance in this regard since they can both be of great cultural value to the people, and also help to preserve biodiversity [16–19]). Besides the conversion of formerly pristine habitats into agricultural areas, land use intensification is one of the main drivers of biodiversity loss [1,16]). Among other drawbacks, intensively managed farmland provides considerably fewer habitats for wildlife due to large plot sizes, little crop diversity and a lack of buffering field borders, as well as high inputs of mineral fertilizers and pesticides to increase productivity [13]. In contrast, low-intensity agriculture, as practiced in the past, creates diverse habitat mosaics and far more opportunities for biodiversity conservation [13,20,21]. These findings are very relevant for the management of biosphere reserves, which are designed to serve as model regions for the integration of sustainable development and nature conservation. Ecosystem services play an important role in this context and are supposed to be monitored and protected within the reserves [22]; yet biosphere reserves are seldom selected for study when looking at ecosystem services.

Agricultural practices, whether traditional or modern, and the way ecosystem services are assessed inevitably cause trade-offs between the main goal of provisioning and other ecosystem services, calling for the application of appropriate and thoughtful management [14,23]. Political instruments such as agri-environmental support schemes can help to enhance the sustainability of today's and future land use management, including ecosystem service provision [16]. In this regard, the Common Agricultural Policy of the European Union (CAP) has been reformed over the last decades and now also provides support for biodiversity conservation, landscape maintenance and cultural heritage preservation [24], a good, but expandable, starting point for better recognition of, among others, cultural services in funding schemes.

This work looks at the cultural services in agricultural areas of a biosphere reserve in southwestern Germany. Since biodiversity is acknowledged as being beneficial or in some cases even crucial for ecosystem services [1,6,13,25], but at the same time not yet extensively examined in combination with CES, we particularly focused our study on the interrelationships between service provision and biodiversity. Previous studies on CES in rural or more specifically agricultural settings used various evaluation tools, reflecting the multifaceted character of this group of services. Economic, monetary valuation tools appear to be problematic for many CES [12,25]. Alternatively, we integrated insights from different non-economic studies, including interviews on personal experiences or preferences [26–28], participatory mapping [29–32] and the assessment of proxies such as visible manifestations of CES in the landscape [33]. Using comparative analyses of CES provides additional validation for results [31], therefore our study combines the aforementioned approaches to achieve a broad, multi-disciplinary view, while explicitly involving landscape visitors and examining small-scale landscape features. In contrast to many other surveys which focused on a few specific cultural services cf. [4,30,31,34,35], we included a wide range of subgroups.

We conducted a survey including a mapping task in six spatially explicit study plots not only to investigate people's perceptions, but also their needs concerning CES, biodiversity, and the landscape features providing them. To complement our findings we explored socio-demographic and small-scale regional differences. With the help of these various kinds of information we identified stakeholders and priority fields of action concerning the integration of CES into planning of cultural landscapes. Our study area, the biosphere reserve Swabian Alb, represents an important recreational area for the inhabitants of the metropolitan region of Stuttgart. It is known for its traditional, diverse landscapes, whose conservation is crucial for providing numerous services and biodiversity. Our study was part of a larger project which assessed biodiversity and ecosystem services within the Swabian Alb's agricultural landscapes to derive strategies for integrating ecosystem services into planning decisions. In this context, the study at hand presents a concept for evaluating CES, their spatial distribution and linkages to features of landscapes, which could be applied in the biosphere reserve's monitoring of ecosystem services. The following research questions guided our study.

1. How do visitors use the agricultural landscapes in the biosphere reserve and which CES do they identify and value most?
2. How do the people perceive biodiversity and what relationships between biodiversity and CES can be identified based on the visitors' perceptions?
3. Taking into account the visitors' views, how can the agricultural landscapes be improved to provide CES better?

2. Materials and Methods

2.1. Study Area

The Swabian Alb is a low mountain range of Jurassic origin with a length of ~200 km located in the Federal State of Baden-Württemberg, Germany (Figure 1). The biosphere reserve Swabian Alb is located in the center of the low mountain range between the metropolitan area of Stuttgart in the northwest and the upper reaches of the river Danube in the southeast, and was internationally recognized by UNESCO in 2009 [36]. It covers a total area of 850 km^2 and is populated by ~150,000 people [36]. The altitude above sea level ranges from 328 m up to 872 m [37].

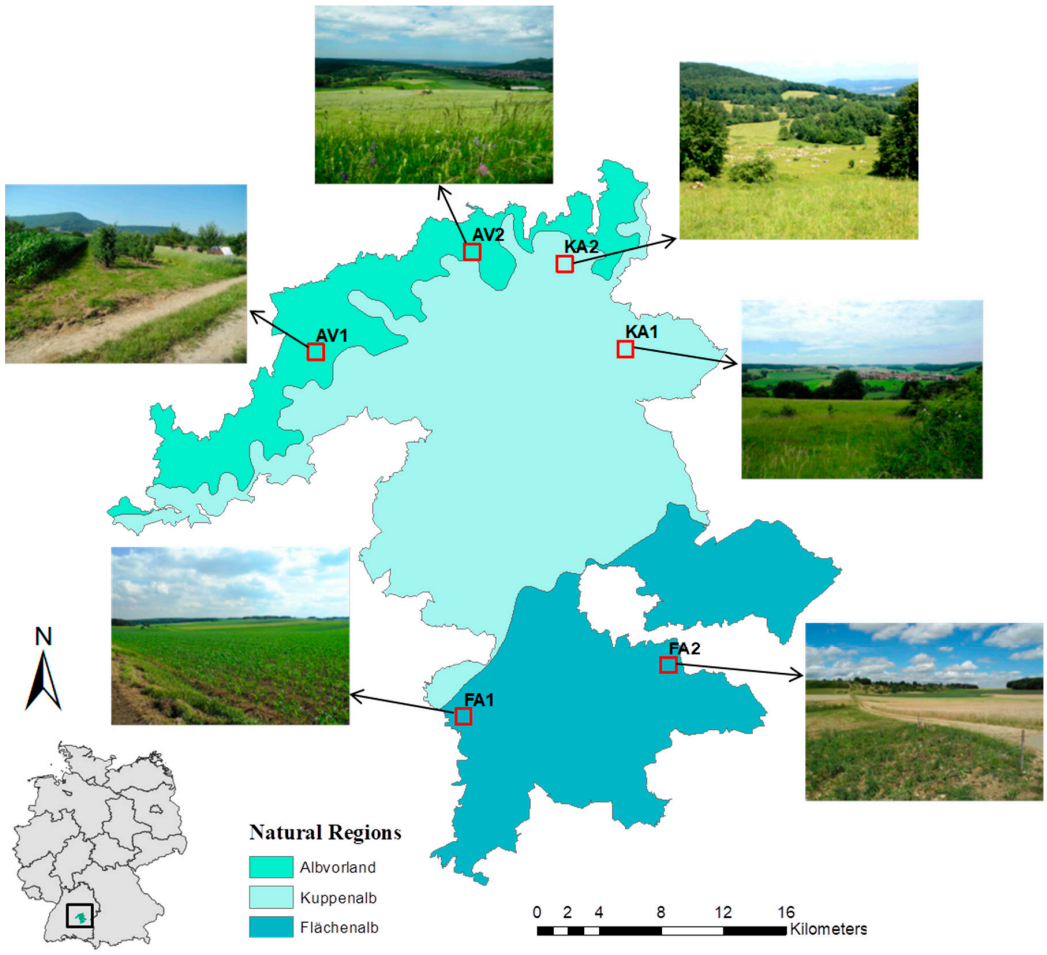

Figure 1. Location of the biosphere reserve Swabian Alb in southwestern Germany (small map) and the distribution of the six study plots within the three natural regions of the Swabian Alb, from North to South: AV1 and AV2 in the "Albvorland", KA1 and KA2 in the "Kuppenalb", and FA1 and FA2 in the "Flächenalb" (biosphere reserve map from LUBW 2015).

The biosphere reserve is characterized by highly variable habitat types, which are the basis for its unique biodiversity of supraregional and national importance [37]. It is divided into three main biogeographic regions with different characteristics (Figure 1; Table 1). The northeastern foothills are called "Albvorland" and are largely covered with extensive traditional orchards, the typical "Streuobstwiesen" of southern Germany [37]. They represent a low-intensity agricultural system where meadows or pastures are combined with fruit production [38]. These systems are very biodiverse and offer habitats for ~5000 different species of plants and animals [38]. In Germany, such traditional orchards date back to the 19th and early 20th century, but their distribution severely declined since the 1960s [38]. Nevertheless, Baden-Württemberg still harbors the largest connected area of "Streuobstwiesen" in Europe, and therefore bears a special responsibility for their conservation [38]. The "Albvorland" has the highest population and, due to the proximity to the metropolitan area of Stuttgart, a better-developed economic sector than the other biogeographic regions [37]. The terrain rises into the Alb plateau (above 700 m a.s.l.) which harbors numerous rare plants and animals in its dry juniper heaths and low-nutrient limestone meadows, remnants from the traditional cultural landscapes of the 18th and 19th century [37]. The plateau encompasses the other two biogeographic regions. The hilly landscape of the "Kuppenalb" in the center of the reserve is characterized by small, alternating patches of forests and grassland [37]. The adjoining "Flächenalb" in the southeastern part of the reserve is rather flat, sparsely populated, and marked by modern agricultural usage [37].

Table 1. Demographic and ecological information about the six study plots in the biosphere reserve Swabian Alb (biosphere reserve data taken from [37]). The average grassland/farmland ratio of the regions ±10% tolerance range was used to select the plot locations.

Biogeographic Regions and Study Plots	Population Density	Proportion of Protected Areas	Proportion of Traditional Orchards	Ratio of Permanent Grass-to-Farmland in Agricultural Areas
Albvorland	**499 inhabitants/km**	**60%**	**-**	**80% to 20%**
AV1	-	6.1%	40.1%	71% to 29%
AV2	-	100%	29.2%	73% to 27%
Kuppenalb	**143 inhabitants/km**	**60%**	**-**	**69% to 31%**
KA1	-	44.7%	0%	70% to 30%
KA2	-	100%	1.8%	70% to 30%
Flächenalb	**88 inhabitants/km**	**44%**	**-**	**44% to 56%**
FA1	-	0.7%	0.3%	35% to 65%
FA2	-	10.9%	1.7%	46% to 54%

For the purpose of assessing the status of ecosystem services and biodiversity in the agriculturally used parts of each biogeographic region, the project group set up six representative study plots ("Albvorland": AV1 and AV2; "Kuppenalb": KA1 and KA2; "Flächenalb": FA1 and FA2; Figure 1). A biotope and land use type map [39] served as the basis for the selection of the 1-km^2-sized plots that represented the different region-specific agricultural usages as described in the biosphere reserve's nomination from [37]. This included, in particular, the respective ratios of permanent grass-to-farmland (±10% tolerance range compared to the average of each region) with the proportion of permanent grassland decreasing and farmland increasing from "Albvorland" to "Flächenalb" (Table 1). The survey participants were approached only within these six plots and some questions specifically asked about people's perceptions of, or experiences with, the landscape of these areas. Table 2 provides an overview of the general cultural value and potential usage of the six resulting study plots.

Table 2. Comparison of features/characteristics of the six investigated plots, which might be important for their general cultural value and potential usage.

Albvorland	**AV1**	**AV2**
	• no special touristic/cultural sites or hiking/biking routes • large areas of traditional orchards: cultural heritage of the "Albvorland"	• interesting destinations: traditional orchards, large-scale protected areas and former volcanic vent (natural monument) • several well-known hiking, biking, and Nordic walking routes
Kuppenalb	**KA1**	**KA2**
	• culturally and ecologically important areas of dry meadows under conservation • varied relief enables a wide view over the surrounding landscape	• protected dry meadows and varied relief as in KA1 • widely known nature conservation area with well-developed hiking trails, parking places and information boards
Flächenalb	**FA1**	**FA2**
	• flatter terrain: biking route • no protected areas or special touristic/cultural sites • remote and less accessible	• popular hiking route, viewpoint and a nature conservation area with dry meadows and juniper heath • remote and less accessible

2.2. Survey

Two interviewers conducted the survey among a total of 180 randomly selected landscape visitors (30 per plot) during the months of July and August 2016. Each survey took approximately five to ten minutes. The questionnaire was prepared using the SaaS ("Software as a Service") Maptionnaire [40], which enables the user to create map-based questionnaires, including the option of spatial data collection. Due to limited Internet availability, most surveys were carried out using paper printouts of the questionnaire and only a few using the Maptionnaire software directly on a tablet PC with mobile internet connection for data storage in the cloud. All information collected with the paper-based questionnaires was later digitized with the software, which automatically compiled raw data tables of the respondents' answers.

The questionnaire was structured into five sections and contained multiple choice, ordinal-scale and open-ended questions, as well as the mapping task (see Supplementary Materials for the full questionnaire). Most multiple choice questions included the option *Other* to allow for individual answers, and respondents could tick all that applied to them. Instead of referring to "ecosystems" and "services" in particular, the terms "landscapes" and "values" were used to make the topic more accessible for the people cf. [41].

The first section collected general data on the respondent's landscape usage, including the frequency of visits and the reason(s) for visitation. The second section introduced the main topic with the task of arranging four main groups of CES in an order according to their importance for the respondent (Table 3 for the groups). This was followed by a multiple choice question asking which CES are supported by the landscape of the plot (subgroups in Table 3). Lastly, the respondents were asked to rate their affinity to nature, leading on to the topic of the third section.

Table 3. The four main groups of cultural ecosystem services (CES) and their subgroups as used in the questionnaire (classification after CICES, adapted from [42]).

CES Groups	Recreation	Education	Aesthetics	Natural and Cultural Diversity and Uniqueness
Investigated subgroups	• Sports • Leisure time activities • Tourism	• Environmental education • Education/ upbringing of children	• Landscape aesthetics	• Sense of place • Cultural heritage

The third section asked about knowledge of biodiversity and species diversity, as well as the value of the biodiversity of a landscape. The fourth section included the participatory mapping, where the respondents should indicate places of high importance in an aerial photograph of the respective plot. Subsequently, the attractiveness of the landscape in the plot had to be rated, and afterwards two multiple choice questions asked about particularly appealing (semi-)natural (incl. agricultural areas such as meadows or fields) and artificial landscape structures in the plot. Finally, the respondents were asked whether they had suggestions for improvements of the plot's landscape and/or any other comments about the landscape and its meaning for them. The questionnaire ended with a section recording the socio-demographic details of the respondents. This included gender, age, connection to land use (e.g., profession in the field, a kitchen garden, and ownership of a traditional orchard), and place of residence (either local from less than 10 km distance from the plot or non-local from further away).

2.3. Data Analysis

2.3.1. Questionnaire

The survey data was categorized into three groups (Table 4). The inferential statistics focused on the relationship between our seven explanatory variables and the response variables of group I (note that frequency of visits and ratings served as both explanatory and response variables depending on the context; see Supplementary Material for information about which explanatory variables were included in each analysis). The second group of response variables was only analyzed descriptively. The answers to open questions such as suggestions for improvements were coded to enable quantitative interpretations.

Table 4. Categories of variables resulting from the questionnaire. The main focus of the statistical analysis lies on relationships between the first two groups; the third group is analyzed descriptively/qualitatively.

Explanatory Variables	Response Variables I	Response Variables II
• Gender • Age classes • Connection to land use (y/n) • Local (y/n) • Plot • Frequency of visits • Ratings of affinity to nature, biodiversity knowledge etc.	• Usage (e.g., biking, hiking) • Frequency of visits • Ranking CES groups • Present CES (subgroups, e.g., tourism, sense of place) • Ratings of affinity to nature, biodiversity knowledge etc.	• Appreciated (semi-)natural structures (e.g., orchards, meadows) • Appreciated artificial structures (e.g., benches, paths) • Proposed improvements and comments (open questions)

The statistical analyses were performed in RStudio (version 3.2.1) [43]. In the first stage of analysis we focused on the relationships between the explanatory variables and the first group of response variables. The corresponding data were of two kinds: Binary (0 for not ticked/1 for ticked) in the case of multiple-choice responses, for example about usage and CES of the plot, or ordinal in the case of CES ranking, ratings, and frequency of visits.

The binary response variables were analyzed using generalized linear models with a binomial error distribution. To test for significance we used ANOVAs (Analyses of Variance) with chi-square test statistics and manual variable selection based on the likelihood ratio tests. To explore how the remaining significant variables influenced the response variables, and to see the difference between factor groups, we created contingency tables with percentages of people who ticked the respective option. In the case of the multiple choice question about respondents' usage of the plots we decided to only analyze the four most common types of usage in depth. The other types were chosen by less than 20% of the respondents, making the sample size very small, and potentially confounding the results.

The ordinal-scaled data were analyzed using proportional odds logistic regressions (R-package MASS [44]). They fit a logistic regression model to an ordered factor response assuming proportional odds. As before, ANOVAs with manual variable selection were performed to filter out the best predictors, and contingency tables or boxplots were created to compare the different factor groups of the remaining significant variables.

Lastly, we tested for relationships between people's ratings of their affinity to nature, knowledge about biodiversity and value of biodiversity using Spearman's Rank Correlation Coefficient (Spearman's rho).

2.3.2. Mapping Data

In the participatory mapping task the respondents could choose between indicating point, line and/or polygon (=areal) features they found important, interesting, beautiful, or otherwise remarkable within the plots. The collected information was downloaded from the Maptionnaire software and

analyzed with Microsoft Excel in table format and ArcGIS (version 10.3.1) [45] in shapefile format. All marked features were grouped into the four categories identity, heritage, aesthetics, and recreation, depending on which cultural ecosystem service they contributed to. The criteria for the categorization followed a study by Bieling and Plieninger [33], who mapped visible manifestations of cultural usage in the Swabian Alb and then correlated them to CES groups described by the Millennium Ecosystem Assessment. The categories were not exclusive, meaning that for example a bench could fall into both aesthetics and recreation. Not all features marked by respondents were "visible manifestations" in the sense of the study mentioned before, but included (semi-)natural features such as a meadow, forest patch, or nature conservation area. Nonetheless, we placed them into one of the categories depending on why the people marked them, which were mostly aesthetic reasons.

To prepare the data for further analysis, we calculated the centroid of all marked polygons, turning them into point features. We merged these with the marked points and conducted a hot spot analysis for all plots to find out which areas were significantly more often identified as being important to the people. As the basis for area selection we used biotope type maps which were previously developed for each plot within the project. The resulting significant areas and also the raw data of marked points, lines, and polygons were then looked at in reference to their biotope (and thus land use) types and protected areas (including nature conservation areas and natural monuments [46] and Natura 2000 areas [47]) they coincided with, to see whether the places that matter to people match with biodiverse and officially recognized areas of importance. The protected area information was taken from publicly available geodata from the "Landesamt für Umwelt, Messungen und Naturschutz Baden-Württemberg" (LUBW).

3. Results

3.1. Sample Characteristics

The gender ratio was almost equal with 53% female and 47% male respondents. Only 15% of all people were younger than 40 years; 42% were between 41 and 60 years old. Almost one-third of the people were 61–70 years old, and 13% represented the age class older than 71 years. Regarding the place of residence, 59% of all respondents were locals from a distance of less than 10 km from the respective study plot, the rest came from further away, mostly a different administrative district from the one of the plot. Approximately two-thirds of the respondents confirmed a connection to land use, especially by having a kitchen garden or owning orchards or meadows.

3.2. Frequency of Visits, Usage and CES

3.2.1. Frequency of Visits

Approximately half of the respondents visited the respective study plot at least once a week. The remaining people came less frequently, with the majority of them being first-time day-trippers.

The frequency of visits was significantly affected by the place of residence (χ^2 1 df = 130.48, $p < 0.001$). A majority of 82% of the non-locals visited less than a few times per month, as compared to 67% of the locals coming at least several times a week.

3.2.2. Usage of Plots

The most common types of usage of all study plots (note that the answers were nonexclusive) are shown in Figure 2. The majority of respondents ticked the option "enjoy nature" when asked for their reason for visiting the plot. The next most chosen reasons were biking, hiking and walking. Other options such as dog or Nordic walking were chosen by less than 20% of the people.

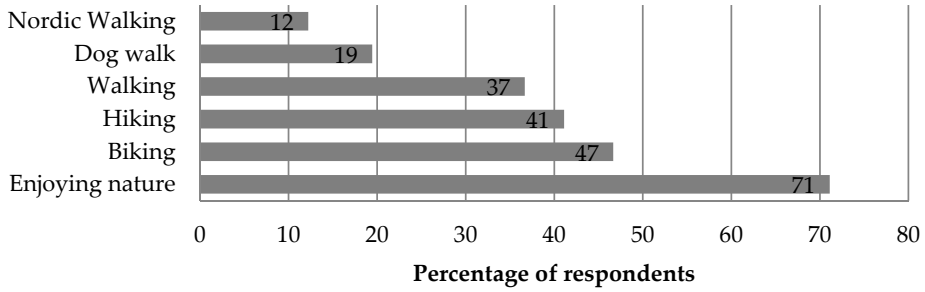

Figure 2. Most common types of usage of all plots (no exclusive answers, 180 respondents).

The number of people enjoying nature was best predicted by the factors age (χ^2 1df = 4.07, $p < 0.05$), the rank of the service recreation (χ^2 1df = 7.67, $p < 0.01$), and the place of residence (χ^2 1df = 9.38, $p < 0.01$). Older respondents chose enjoying nature much more frequently than younger respondents (percentages increased from 33% in 16–20-year-olds to 80% in 61–70-year-olds). Higher ranks of the service recreation (rank 1: 72% chose enjoying nature; rank 4: 0% chose enjoying nature) and being a non-local resident (84% of non-locals vs. 62% of locals chose enjoying nature) were also associated with stating this activity.

The number of people biking was affected by the factors gender (χ^2 1df = 3.96, $p < 0.05$), people's connection to land use (χ^2 1df = 11.36, $p < 0.001$), and the plot (χ^2 5df = 32.52, $p < 0.001$). Male respondents chose the option biking more often than females did (53% vs. 41%). More respondents with a connection to land use chose biking than those without a connection (58% vs. 29%). In the "Albvorland" plots approximately a third of the people stated that they usually come for biking. The "Kuppenalb" plots differed, with three times more bikers in KA1 (60%) than in KA2 (20%). Eighty-four percent of the respondents in FA1 on the "Flächenalb" ticked biking as their usual type of usage, opposed to 47% in FA2.

Hiking was significantly influenced by the place of residence (χ^2 1df = 11.51, $p < 0.001$) and plot (χ^2 5df = 42.02, $p < 0.001$). Fewer local respondents used the plots for hiking than non-locals did (27% vs. 61%). In the "Albvorland" plots, about a fourth of the people came for hiking, similar to the percentages in the "Flächenalb" plots. However, the "Kuppenalb" was used for hiking by 70% (KA1) or even 83% (KA2) of the people.

Walking was only influenced by one factor, the place of residence (χ^2 1df = 27.57, $p < 0.001$). About half of the respondents living in the vicinity of the plot indicated they came there to take walks, whereas only 15% of the non-locals chose this type of usage.

3.2.3. Cultural Ecosystem Services

The CES provided by the plots were most commonly identified as being leisure activities and sports (Figure 3). These were followed by the services tourism, landscape aesthetics, identification, and cultural heritage. Environmental education was chosen in only about a fourth of cases, and the service ticked by the least people was education.

We only obtained significant results in the analyses of tourism and identification. The service tourism was significantly different between plots (χ^2 5df = 15.13, $p < 0.01$). The percentage of people identifying tourism as a cultural service was particularly high in the plot KA2 (67%), followed by the plots of the "Flächenalb" and AV2 with approximately half of the respondents choosing this CES. In KA1 and AV1 less than a third of the people chose tourism.

The number of people experiencing identification as a cultural service was influenced by the place of residence (χ^2 1df = 4.72, $p < 0.05$) since 53% of the local visitors chose this option, compared to 36% of the non-locals.

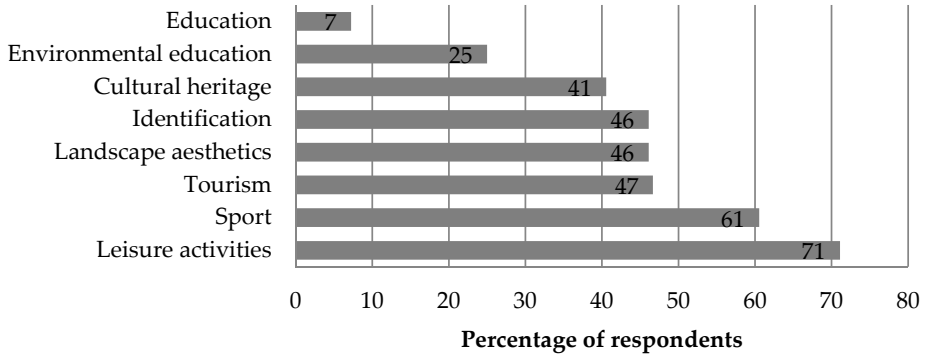

Figure 3. Most common cultural ecosystem services in all plots (no exclusive answers, 180 respondents).

3.3. Results from the Ranking and Ratings

3.3.1. Ranking of CES

When asked to rank the CES groups recreation, aesthetics, cultural/natural diversity, and education, 39 respondents found two or more categories equally important in a landscape, resulting in the same ranks for them. These particular cases were omitted from all analyses including the rankings since they could not be adequately considered by the chosen method of data analysis.

Figure 4 depicts the results of the remaining 141 respondents. Taking into account distribution and median, recreation was ranked first, landscape aesthetics second, natural/cultural diversity and uniqueness third, and education fourth.

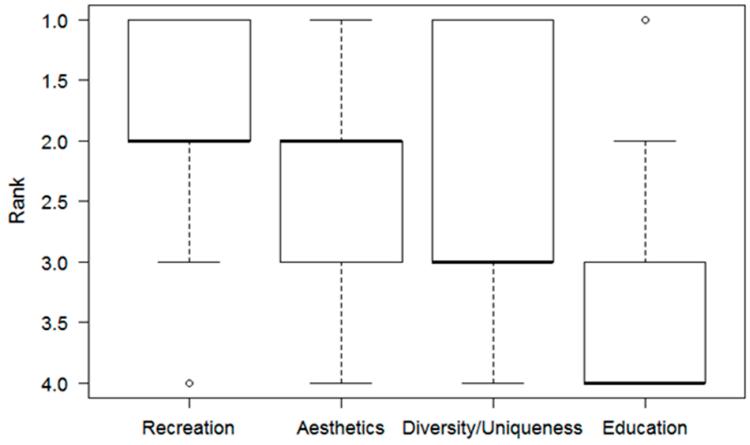

Figure 4. Results of the ranking of the cultural ecosystem services recreation, aesthetics, cultural/natural diversity and uniqueness, and education from all respondents.

Only the services aesthetics and cultural/natural diversity and uniqueness were ranked differently between groups. Gender was the best predictor for the rank of aesthetics (χ^2 1df = 4.27, $p < 0.05$). Here, men assigned a rank higher than two in more cases than women. The rank of cultural/natural diversity and uniqueness was best explained by people's connection to land use (χ^2 1df = 6.78, $p < 0.01$). Respondents with no connection to land use assigned comparatively lower ranks (median of 3) to this service than those with a connection to land use (median of 2).

3.3.2. Rating of Affinity to Nature, Knowledge about and Value of Biodiversity, and Attractiveness of Plot

The results from the four ratings are shown in Figure 5. General affinity to nature was rated high with a mean value of 4.4 out of 5. The mean estimated knowledge about biodiversity was 2.8 out of 5. The value of biodiversity was rated higher with a mean of 4.3 out of 5. Lastly, the mean attractiveness of the plots was 4 out of 5, however, with a large variance of almost 1.

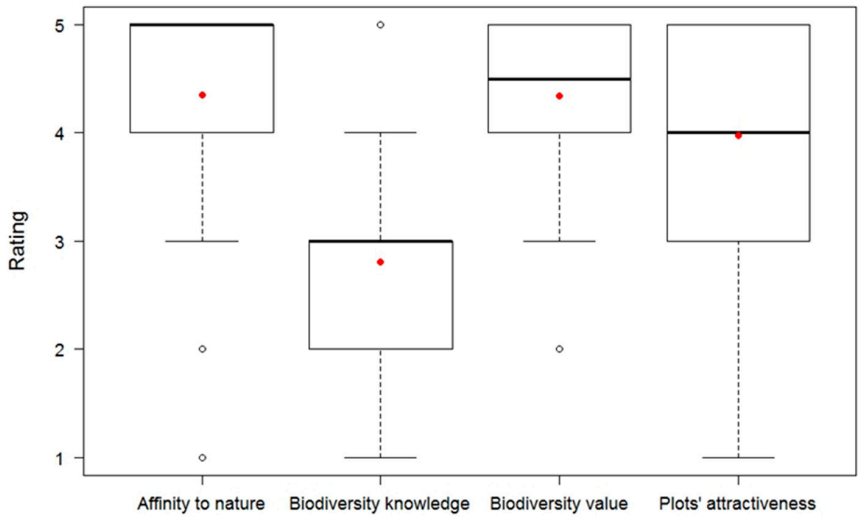

Figure 5. Results of the rating of affinity to nature, knowledge and value of biodiversity, and attractiveness of the plot, each on a scale from 1 (low) to 5 (high). Red dots indicate the means.

We found significant, positive correlations when looking at the relationships between three of the ratings (Figure 6). The correlation coefficient r for affinity to nature and knowledge about biodiversity was 0.29 ($p < 0.001$). For both the correlation between affinity to nature and value of biodiversity and knowledge about biodiversity and the value of biodiversity r was 0.26 (in both cases $p < 0.001$).

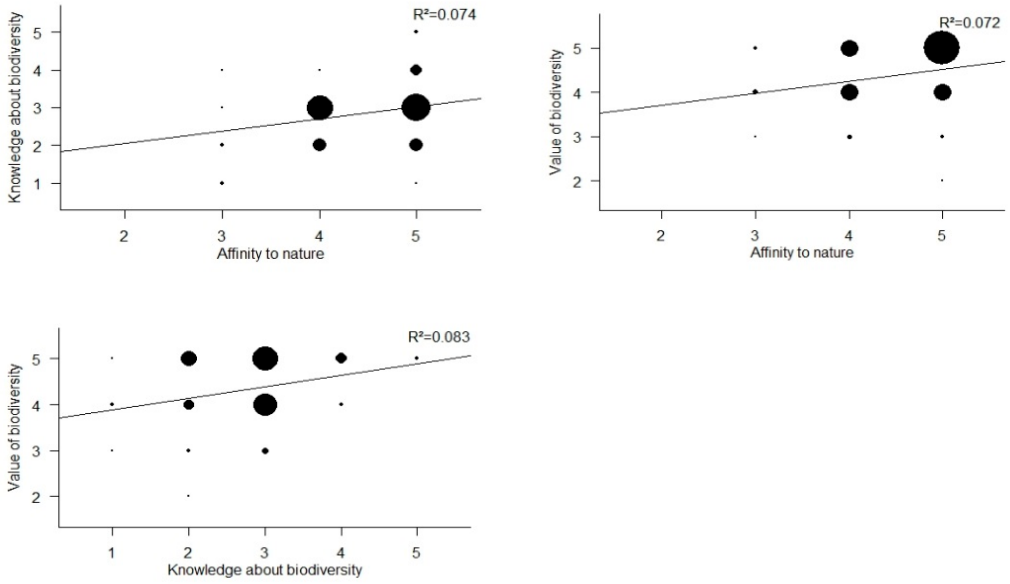

Figure 6. Relationships between the three ratings knowledge about biodiversity, value of biodiversity, and affinity to nature, each on a scale from 1 (low) to 5 (high). The different dot sizes indicate the number of observations of a specific combination of ratings (the larger the dot the more observations). The regression lines are based on linear regressions of the respective variables; R^2 is the adjusted coefficient of determination.

Furthermore, the affinity to nature was significantly influenced by age (χ^2 1df = 4.50, $p < 0.05$) and gender (χ^2 1df = 5.70, $p < 0.05$). Younger respondents reported a lower mean affinity to nature than older respondents (mean increasing from 3.9 to 4.4). Additionally, female respondents reported to have a higher affinity than male respondents (mean of 4.4/median of 5 vs. mean of 4.3/median of 4).

The rating of the attractiveness of the plot was significantly influenced by gender (χ^2 1df = 5.97, $p < 0.05$) and plot (χ^2 5df = 31.65, $p < 0.05$). The arithmetic mean was 4.1 for women and 3.8 for men.

The plots AV2 and KA2 gained the highest mean rating of 4.3. The other plot in the "Kuppenalb", KA1, gained a slightly lower value of 4.2, followed by AV1 with 3.9. The plots in the "Flächenalb" were attributed with the lowest mean values (FA1: 3.4; FA2: 3.6).

3.4. Appreciated (Semi-)Natural and Artificial Landscape Structures

In the fourth section of the questionnaire the respondents were asked to indicate which (semi-)natural landscape structures they appreciated most in the plot they were visiting. The most chosen options were landscape and/or species diversity, meadows, and hedges and/or groves, followed by fields, orchards, and pastures. Other (semi-)natural structures that people added themselves included the varied relief and small-scale features such as ponds or flower strips. Only in a very few cases did people find no appealing (semi-)natural structures in their plot. Table 5 depicts the results of all plots and uncovers regional differences.

Table 5. Appreciated (semi-)natural landscape structures of all plots (no exclusive answers). Specific landscape features were individually added by the respondents, e.g., ponds or flower strips. Percentages are to be interpreted in relation to the 30 respondents of each plot or for the total number in relation to the whole sample of 180 respondents. Differences between plots and regions are visualized by cell colors, the higher the percentage the darker the color.

Plot	Albvorland		Kuppenalb		Flächenalb		Total
	AV1	AV2	KA1	KA2	FA1	FA2	
Landscape/Species diversity	53%	80%	63%	77%	53%	53%	**63%**
Meadows	43%	57%	63%	37%	40%	57%	**49%**
Hedges/Groves	7%	13%	47%	33%	70%	40%	**35%**
Fields	27%	23%	33%	13%	57%	33%	**31%**
Orchards	83%	63%	0%	23%	0%	3%	**29%**
Pastures	17%	10%	37%	27%	3%	40%	**22%**
Relief	10%	20%	40%	7%	20%	7%	**17%**
Specific features	3%	0%	7%	0%	20%	0%	**5%**
None	3%	0%	0%	0%	0%	3%	**1%**

The following multiple choice question was about the artificial structures people appreciated in their respective plot. The three most chosen options were viewpoints, benches, and information boards. Parking places and buildings came next; additionally, some people stated to like structures such as plot-specific features (e.g., a barbecue area) or paths. Nevertheless, almost one-third of the people indicated that they appreciated no specific artificial structures in the plot. Table 6 depicts the results of all plots and also shows regional differences.

Table 6. Appreciated artificial landscape structures of all plots (no exclusive answers). Percentages are to be interpreted in relation to the 30 respondents of each plot or for the total number in relation to the whole sample of 180 respondents. Differences between plots and regions are visualized by cell colors, the higher the percentage the darker the color.

Plot	Albvorland		Kuppenalb		Flächenalb		Total
	AV1	AV2	KA1	KA2	FA1	FA2	
Viewpoints	20%	13%	70%	67%	20%	67%	**43%**
Benches	23%	47%	53%	33%	20%	40%	**36%**
Information boards	23%	23%	37%	43%	37%	53%	**36%**
None	53%	40%	17%	10%	23%	17%	**27%**
Parking places	7%	3%	27%	27%	17%	10%	**15%**
Buildings	3%	3%	10%	20%	23%	7%	**11%**
Specific features	0%	0%	0%	3%	10%	3%	**3%**
Paths	0%	3%	0%	0%	10%	0%	**2%**

3.5. Results from the Participatory Mapping

A total of 213 points, lines, and areas were identified as being important to the respondents, with almost 40% of them being natural features. The majority of all marked places were categorized as contributing to the service aesthetics; next came recreation, identity, and lastly, heritage. The respondents in FA2 marked the most places (51), followed by KA2 (45), AV2 (44), AV1 (30), and finally, KA1 (22) and FA1 (22). Except for AV1 and FA1, all plots had distinct areas with hot spots of important places, which frequently coincided with sites relevant to biodiversity conservation, including Natura 2000 areas, nature conservation areas, or natural monuments (Figure 7).

Figure 7. Aerial photographs of the six study plots AV1 (**A**), AV2 (**B**), KA1 (**C**), KA2 (**D**), FA1 (**E**), and FA2 (**F**), including protected areas and natural monuments, by respondents marked places of interest (points, lines, and centroids of polygons) and the hot spots of marked places as calculated by the optimized hot spot analysis in ArcGIS, indicating also the level of confidence with which they were selected (aerial photographs: Landesamt für Geoinformation und Landentwicklung (LGL) 2011; protected areas/natural monuments: LUBW 2016).

The plots in the "Albvorland" had the highest share of places contributing to identity and recreation, due to many markings of private garden plots or traditional orchards and hiking/biking routes. However, AV2 had more places associated with aesthetics than AV1, based on a higher number of marked natural features. These were forest patches, natural viewpoints and its natural monument (a former volcanic vent) in the east. The latter also served as the center for the hot spot of marked places of interest in AV2 (Figure 7B). The main biotope types there were nutrient-poor grasslands, orchards, garden plots, and nutrient-rich meadows. Small shares of fields and a gravel path were identified by the analysis as well.

The "Kuppenalb" plots were most popular for their aesthetic value owing to their attractive dry meadows and relief. The well-known nature conservation area in the northeast of KA2 was a particular hot spot for aesthetically appealing features (Figure 7D). The biotope types included in the hot spot were pastures, groves, a small pond, an asphalted and a grass path. Apart from that the respondents in KA2 marked more places contributing to recreation than in KA1 as a result of its better touristic infrastructure made up by trails and recreational sites. The hot spots in KA1 were smaller, of less significance (lower confidence level) and included an asphalted path in the north and nutrient-poor grasslands (Figure 7C). The grasslands and many of respondents' points of interest were located inside or close to a Natura 2000 site.

The plots in the "Flächenalb" also differed in their places of importance. The people marked many more places in FA2, especially around its viewpoint in the northwest, a near-natural pond in the south, its nature conservation area in the north, and hiking/riding trails (thus contributing to aesthetics and recreation). These areas were also identified as significant hot spots by our spatial analysis (Figure 7F). The main biotope types there were nutrient-poor grasslands, juniper heathland, rich meadows, groves, and fields. Although respondents in FA1 also marked a number of scattered aesthetically pleasing places (such as groves or a flower strip at a field), they indicated only a few sites of recreational, heritage, or identity value.

3.6. Landscape Improvements

When asked whether they could think of possible improvements to the landscape in their respective plot, 15% of all respondents suggested one or more improvements of (semi-)natural structures and 41% suggested one or more improvements of artificial structures. We categorized improvements of (semi-)natural structures as mainly contributing to the cultural services aesthetics and cultural/natural diversity and uniqueness (including cultural heritage and identity). Improvements in artificial structures were regarded as mainly contributing to recreation (including sports, leisure activities, and tourism) and environmental education. The plots differed in their share of (semi-)natural and artificial improvements. In almost all plots the proportion of people suggesting artificial improvements was much higher than the proportion suggesting (semi-)natural improvements. Exceptions were KA1 and FA1, where in both cases 37% of the respondents suggested artificial improvements, compared to a little lower (KA1) and the same (FA1) proportion of (semi-)natural improvements.

Although some improvements were plot-specific, many were also recurring. More extensive, small-scale agriculture, an increase in structures such as hedges or flower strips, and conservation/increase of pastureland were commonly suggested as (semi-)natural improvements. A reduction in maize cultivation was additionally recommended a few times in FA1. Recurring artificial improvements included an increase in signposts, information boards, or benches, and better maintenance of paths. In AV2 and KA2, some people (mainly locals) expressed that they were critical about the touristic usage of the area and that it became less enjoyable when too many people came. Another reason for concern by some respondents in FA2 was the imminent land consolidation, since they feared it might threaten biodiversity and small-scale agriculture.

Nonetheless, when we asked for additional comments on the landscape and its meaning for the respondents, many gave positive feedback. They often wanted the landscape to be preserved as it was, and/or stated that they felt personally attached to and liked the traditional character of the landscape,

especially as a recreational area or due to aesthetical reasons. Plot FA1 was an exception, with only very few positive comments.

4. Discussion

Successful planning and management of multifunctional landscapes poses many challenges. Different types of land user groups need to be considered, showing individual preferences and principles concerning ecosystem services, benefits, and their management [7,12]. The concept of Ecosystem Services [1] provides a useful tool for the integration of biodiversity, ecosystem functions, and variable human benefits from ecosystems.

Trade-offs have to be carefully weighed and interdependencies among services should be taken into account [9,12]. Appropriate agricultural practices can turn such interdependencies (also between services and the biophysical environment) into advantages and produce synergies for mutual benefits [14,21]. For instance, Raudsepp-Hearne et al. [23] found a positive correlation between the provision of regulating and cultural services, which specifically applied in highly multifunctional landscapes. These are characterized by a higher biodiversity than homogenous agricultural landscapes [13], opening up opportunities for simultaneous service and nature conservation approaches [48].

The study at hand confirmed the high value of, but also revealed regional differences in the Swabian Alb's agricultural landscapes in terms of CES and biodiversity. We discuss the results in the context of our three guiding research questions to derive a number of management recommendations for future land use planning in the biosphere reserve.

4.1. Question 1: Usage and Cultural Services of the Agricultural Landscapes

The agricultural landscapes in the study plots are used in a variety of ways, reflecting the manifold opportunities agricultural landscapes can provide in terms of CES. Leisure activities, sports, tourism, landscape aesthetics and identification were found to be the most outstanding cultural services, also prominent in other European case studies set in agricultural landscapes e.g., [18,41,49]. It is thus suggested to focus CES management in the biosphere reserve on those services, in particular regarding the fact that economic benefit obtained by tourism in the biosphere reserve is estimated to be considerably higher than that from agriculture (Dieterich 2012 in [50]). Independently of their presence in our sample plots, recreation and aesthetics were identified as the most important cultural ecosystem service groups. These services likewise played an important role in cultural landscapes in the Netherlands [49], Spain [34], and Swabian Alb short story writers [41], further backing up our findings.

The geomorphological heterogeneity and the respective land use as well as infrastructural heterogeneity of the Swabian Alb biosphere reserve resulted in differences in usage and evaluation of the six surveyed areas by their visitors. An earlier study by Roser [51] addressed the factors that enhance or reduce the appearance of the landscape in the Swabian Alb biosphere reserve. Factors with a positive influence on people's ratings included landscape diversity, traditional orchards and relief intensity. These factors also applied to our more attractive plots, pleading for the conservation of diverse, traditional land use systems, or (in the case of the non-manageable relief) a focus on such areas in management plans for CES. Additional to their landscape composition, the accessibility of areas and distance to tourist destinations likely influenced people's usage and perception [42,48]. The "Flächenalb"-plots are poorly accessible compared to most of the others, as a result such areas may need special attention if an increase in their touristic value is desired.

Similar to studies by Zoderer et al. [18] and van Zanten et al. [35], we found that socio-demographic groups vary in their usage of landscapes and perception of CES. Differences in the valuation of cultural services between different people and under different socio-economic conditions can complicate the preparation of definite land use plans [7]. However, knowledge about differences can also be of assistance to advance management plans concerning the needs of the public. In our case,

the respondent's age, place of residence, gender and connection to land use were of particular interest and influence. Older people and women, for instance, used the landscapes to enjoy nature rather than for sports like biking, and might thus be more in need of semi-natural structures which diversify the agro-ecosystems. In previous studies, women claimed higher aesthetic values and greater well-being associated with the green spaces [52] or had stronger preferences for native flora, trees or shrubs, and specialty crops [53]. Mobley et al. [54] additionally report that women are more likely to engage in so-called "environmentally responsible behavior" in daily life than men, making them potentially important stakeholders in conservation contexts.

Local and non-local visitors also differed regarding their activities and, most importantly, locals expressed that the landscape created a sense of place in more cases than non-local visitors. The importance of sense of place in our study region was also revealed through short stories from residents of the Swabian Alb [41]. Identity, sense of place, and cultural heritage were shown to have a synergistic relationship with traditional rural landscapes [19], and can be a step towards a feeling of public land stewardship [55]. This directs attention to their integration in the formulation of land use plans to ensure sustainable development in biosphere reserves.

4.2. Question 2: Relationships between Biodiversity and CES

Biodiversity hot spots and the provision of ecosystem services seem to be spatially correlated and can therefore yield opportunities for conservation [6]. Two studies on the attitudes of Europeans towards biodiversity and nature from 2010 and 2016 showed that people are generally aware of the significance of wild nature and biological diversity, finding their conservation important [56,57]. Furthermore, the 2010 study found that particularly Germans have high biodiversity awareness and also have some, or even good knowledge, about biodiversity issues [56]; this we could confirm.

Rather than specific land use types, the majority of our survey participants said they liked the landscape and species diversity in the plots. Other European studies also note that landscape users value diverse mosaic landscapes highly [32,34,35,49,58]. Moreover, two previous case studies from the Swabian Alb support the finding that landscape diversity is an important aspect contributing to the biosphere reserve's aesthetic beauty [41,51]. Meadows came second in the list of appreciated (semi-)natural structures. Since they cover much of the protected areas in the plots and were often marked as important by visitors (especially the low-nutrient, flower-rich ones), we suggest the conservation of low-intensity grassland as a socially highly appreciated field of action in land use management. Additionally, species-rich grasslands can support other ecosystem services by, among others, providing food and habitat resources for pollinators or natural enemies of agricultural pests, as well as increasing resilience after disturbances cf. [13], adding to the multifunctionality of landscapes.

In general, the points of interest that were marked in the aerial photographs of the plots frequently coincided with protected areas. Albert et al. [42] emphasized their importance for CES and defined the "accessibility of nature conservation areas" as an indicator for the recreational value of landscapes. Since biodiverse habitats can also be protected specifically as attractions for ecotourists [37] not only cultural services benefit from biodiversity, but also vice versa.

Other biodiverse and particularly often marked landscape components such as near natural ponds, hedges, groves, and flower-strips were likely to contribute to not only aesthetic experiences but also a sense of place and heritage values by adding specific character to the landscapes. Hausmann et al. [59] stated that the feeling of sense of place can be deepened by biodiversity experiences, potentially leading to synergies for the benefit of both biodiversity conservation and cultural service provision. The sense of place can be improved through operational support to park management actions, too, which is especially true for children [60]. Our findings further suggest that many people appreciate the non-use, existence value of nature and biodiversity, which is another important aspect of CES [3]. In their case study, Boll et al. [27] found that Hamburg dwellers preferred rural recreation areas that are characterized by certain degrees of naturalness, uniqueness and diversity, likewise implying more opportunities for biodiversity conservation.

Interestingly, our respondents with a connection to land use (either professional or private) found the cultural/natural diversity and uniqueness of a landscape more important than those without a connection. Gao et al. [53] substantiated this by showing that agritourists having some kind of relationship with a farm or forested land express stronger preferences for components contributing to more diverse landscapes.

Based on our findings concerning the relationships between affinity to nature and knowledge about and value of biodiversity, we suggest improving people's knowledge and particularly their affinity to nature as a way to raise awareness about the value of biological diversity, and to promote cross-generational, long-term concern about environmental issues. Support for the importance of environmental knowledge can be derived from Mobley et al. [54] as well as Steg and Vlek [61], whose studies suggest that knowledge about environmental issues and problems increase the likelihood that people engage in pro-environmental behavior.

Among other generational differences, the comparatively lower affinity to nature of our younger participants, suggests a disconnectedness of youth from nature cf. [62–65]. This finding is not necessarily surprising since older respondents in other case studies similarly found outdoor recreation in rural areas more important [27], appreciated the aesthetic beauty of the landscape more [49], or even reported a greater well-being associated with green spaces, and more involvement in nature-related activities than younger people [52]. In this context, children's willingness to conserve biodiversity was shown to be improved by both direct (via outdoor activities) and indirect (via different media) experiences of nature [66,67], opening up various opportunities for action.

A number of sources confirm the importance of biodiversity for cultural services e.g., [25,42,48,59,68]. Yet, from their study on wildflower-viewing as a key biodiversity-based CES, Graves et al. [69] concluded that solely using species richness as an indicator for high cultural value can lead to inaccurate conservation planning. Several aspects of biodiversity as well as social preferences must be considered, treating biodiversity and CES complementary but different when managing landscapes for biodiversity-based CES [69]. Taking that into account, we believe the connection can help to integrate biodiversity and ecosystem service conservation in particular by generating a feeling of land stewardship or public responsibility for nature and its components, to the benefit of human well-being [10,70].

4.3. Question 3: Improvements of Agricultural Landscapes for CES

Almost half of the survey participants had suggestions for how the landscape could be improved, showing their intensive examination and awareness of their environment. Most improvements were proposed in FA1 and KA1, with ideas for both (semi-)natural and artificial structures, suggesting a deficit in a wide range of CES there. Noteworthy recommendations for aesthetics and diversity and uniqueness of the landscape included more extensive land use, increasing biodiversity-supporting structures such as hedges, conserving pastureland, and reducing maize cultivation (the latter was especially present in FA1). Similar results concerning a preference for less intensive agriculture, pastureland and potential opposition to large-scale maize cultivation were found by Boll et al. [17] in their study in the Hamburg metropolitan region. The negative impact of intensive land management on CES is also discussed in a study by Allan et al. [71], who looked at the relationship of land use and ecosystem multifunctionality in three German grassland systems, one being the biosphere reserve Swabian Alb.

Our survey results suggest a potential for improvement with regard to the recreational and educational value of the Swabian Alb landscapes. This could be achieved by, for instance, increasing the number of benches, signposts, and information boards, without over-furnishing the landscape of course. Additionally, trade-offs between services, such as tourism and leisure activities of local visitors, became apparent in the most frequented plots AV2 and KA2. The biosphere reserve's visitor guidance management should take such trade-offs into account, since they can negatively affect the population's acceptance of large-scale protected areas as tourist destinations (officially already addressed in the nomination of the Swabian Alb biosphere reserve; see [37]). Another issue was the

respondents' apprehension that impending land consolidation plans might impair biodiversity and diverse small-scale agriculture. This would represent a trade-off between cultural (and most likely also supporting and regulating) services and the provisioning services of agriculture, as featured in previous research [14,23,71]. However, especially in biosphere reserves, where economic development and land use planning is intended to go hand in hand with landscape and nature conservation, multifunctionality of agricultural areas should be a top priority.

All plots received much additional positive feedback, apart from FA1, again reflecting the less attractive landscape and lack of CES in this rather intensively managed plot on the "Flächenalb". One of the conclusions from the Alpine study by Zoderer et al. [18] was that traditionally used landscapes are of importance for providing aesthetic and recreational services, being valued very highly by the interviewed tourists. These results are in line with, for example, van Berkel and Verburg [49] or Boll et al. [17] who also found that the retention of semi-managed landscape structures was appreciated by the people, and at the same time promotes biodiversity [21]. Barthel et al. [20] described the development of our agricultural landscapes as an "ongoing and accelerating generational amnesia of traditional practices and experiences", which is detrimental to biodiversity and ecosystem services. The (re-)integration of adapted landraces though was shown to provide numerous cultural and traditional values, along with reinforcing social–ecological resilience [72].

Our own survey results emphasize the importance of extensively and traditionally managed, multifunctional agricultural landscapes for the benefit of both people and biodiversity. In this regard, the biosphere reserve Swabian Alb fosters, for instance, the agricultural support program FAKT ("Förderprogramm für Agrarumwelt, Klimaschutz und Tierwohl") for the federal state of Baden-Württemberg, planning of habitat connectivity via compensating measures, conservation, and development of extensively used habitat structures via the EU program Natura 2000, as well as close-to-nature cultivation and marketing of regional products and traditional varieties [36,73]. Such instruments are promising and the results of studies like ours can act as guides for adjusting their support schemes along with the biosphere reserve's management plan.

4.4. Method Discussion

Questionnaires always bear the risk of misunderstandings or individual interpretations of questions and response options. The concept of cultural ecosystem services is still widely unknown to the public, additionally increasing the risk of false interpretations. We addressed this problem by avoiding technical terms in the questionnaire and conducting face-to-face interviews whenever possible to explain questions or critical terms (especially "biodiversity" and the CES subgroups). Nevertheless, a small risk remains, e.g., for the few participants who preferred to fill out the questionnaire by themselves. Additionally, we cannot be completely certain that the visitors attributed exactly our predefined cultural values to their marked features. Sometimes they did or could not describe why they found the respective place to be important, so we had to assume on the basis of our own experiences of location and people, as well as checking against the study by Bieling and Plieninger [33].

We conducted our survey with a total of 180 respondents. This sample size is in the range of other participative studies from the field (e.g., [29]: 93; [49]: 115; [26]: 262; [28]: 294). However, a larger number of participants would be desirable to increase the validity of our findings, especially when comparing socio-demographic groups and plots, and to back up the correlations between affinity to nature, knowledge and valuation of biodiversity.

5. Conclusions

As deeply personal issues concerning practically everybody and synergizing with other services and biodiversity, cultural services of agro-ecosystems should be regarded as important guides for decision-makers in landscape management and planning. In their role as model regions of sustainable, ecologically viable and socially accepted development, biosphere reserves represent perfect trial environments for stronger incorporation of public perceptions. Participatory surveys, where applicable

including CES mapping like the one presented in this work, can help to identify what the population values the most, and what should be improved in agricultural landscapes to serve the needs of the people.

Due to differences in landscape usage and perception, there is a need for inclusion of various socio-demographic groups in planning contexts. Especially locals and their familiarity with the landscapes, and nature-loving older generations may direct decision-makers towards more comprehensive land use management. We also found differences in usage and services on both regional and intraregional scales; thus small-scale landscape planning should be enforced rather than making generalizations about regions. The combination of on-site questionnaires including the collection of spatially explicit data enabled us to gather a wide range of information that can be used to develop land use scenarios in cooperation with the biosphere reserve management.

There is much evidence for how rich diversified agro-ecosystems can be in both cultural services and biodiversity. We regard the connection between the two as a highly significant issue for successful nature conservation efforts, which in turn ultimately affect human life and well-being. In case of the biosphere reserve Swabian Alb, there is a call for action towards managing CES and biodiversity, especially in the more intensively used parts of the "Flächenalb". Its appreciation and value could be increased by diversifying the landscapes with, for instance, traditional orchards, low-input meadows or pastures, field hedges, flower strips and recreational/touristic structures such as benches or information boards. Therefore, political support schemes targeting these topics should be enhanced, and counterproductive incentives such as subsidies for intensive agricultural practices reduced.

The outcomes of this project were used as recommendations in local landscape planning and biosphere reserve management. However, they hold true in other biosphere reserves and our exemplary methodical approach based on relatively small study plots is easily applicable to other contexts.

Building on our findings, we suggest three general priority fields of action for landscape management and planning in agro-ecosystems: (1) Conserving and expanding traditional, extensive land use practices as providers of highly multifunctional production systems, (2) strengthening the status of CES in politics and agri-environmental support schemes, and (3) encouraging public engagement and use of local knowledge in landscape planning contexts.

Supplementary Materials: The following are available online at http://www.mdpi.com/2071-1050/11/9/2650/s1, Questionnaire S1: Translation of used questionnaire, Table S2: Statistical analysis, Table S3: Questionnaire results, Table S4: Marked places of interest.

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