environments

MDPI

Article

Stakeholders' Perspectives to Support the Integration of Ecosystem Services in Spatial Planning in Switzerland

Rémi Jaligot * and Jérôme Chenal

Urban and Regional Planning Community, Ecole Polytechnique Fédérale de Lausanne, ENAC-IA-CEAT, Bâtiment BP, Station 16, 1015 Lausanne, Switzerland

* Correspondence: remi.jaligot@epfl.ch

Received: 26 June 2019; Accepted: 24 July 2019; Published: 26 July 2019

Abstract: Integrating the concept of ecosystem services (ES) into spatial planning is an opportunity to make land use and management choices that maximize the delivery of multiple ES. The assessment of social demand can be useful for the identification of priority areas or potential conflicts among stakeholders. We used Q-methodology to understand stakeholder perspectives on ES to facilitate their integration into spatial planning in the canton of Vaud, Switzerland. Three perspectives, utilitarian, cultural and protective, were analyzed and used to discuss potential implications for spatial planning. First, ecosystem multifunctionality and synergies among ES should be emphasized. Second, the food production system should move away from a productive-only approach, to a system that protects soils and their functions. Providing a paradigm change, arable land could be protected to the same level as forests and farmers could be incentivized further to change their practices. Finally, our findings show a potential over-interpretation of the importance of cultural ES in current planning policies, as most participants would be ready to change their behaviors to preserve biological functions. It would be useful to conduct a similar study in other cantons to ensure that the results are fully representative of the current situation in Switzerland.

Keywords: ecosystem services; social demand; spatial planning; Switzerland; Q-methodology

1. Introduction

Ecosystem services (hereafter ES) can be defined as "the benefits that people derive from biodiversity and ecosystem functions" [1]. ES are directly influenced by spatial planning, which is a key instrument for decision-making to coordinate human activities and their influences on land systems. Including ES in spatial planning is considered a suitable approach for informing, communicating, and consensus-building between multiple actors as it allows multi-sectoral and interdisciplinary collaboration [2,3]. While the concept of ES is considered complementary to current spatial planning practices, there is increasing awareness that benefits provided by natural and land systems were often overlooked or underestimated in planning decisions [4–6]. To overcome this issue, work has been conducted to develop integrated assessment of ES requiring different values, interdisciplinarity, use of multiple methodologies (qualitative and quantitative) at various temporal and spatial scales [7,8]. The use of ES into spatial planning is an opportunity to make land use and management choices that maximize the delivery of multiple ES [9]. Therefore, the assessment and mapping of ES have gained traction, particularly in Europe, under the requirement from the EU Biodiversity Strategy to Member States to evaluate and map ES (Target 2-Action 5) [10–12]. However, research showed that not all ES can be maximized simultaneously other than by trade-offs [13,14]. ES tradeoffs could be addressed by the assessment of ES supply at various planning levels, to assist stakeholders in making

rational decisions, particularly within a temporal informed framework [15]. However, tradeoffs not only arise due to relationships between ES but also due to diverging stakeholders' perception of ES supply with deep-rooted conflicts over rights and resources [16,17]. The growth of conflicting human demands on ES poses a serious threat to ecosystem health and the sustainable development of human society as ES depend on the interactions between supply side (ecosystem) and the demand side (socio-economic) [11]. While much work has focused on the quantification and mapping of ES supply, relatively little effort was put on assessing stakeholder's preferences and perceptions of ES, which can be defined as social demand [18]. However, this is essential to improve the provision of ES for all stakeholders and decrease conflicts to help their integration in planning [19].

ES management decisions often involve complex, uncertain, scientific, social or cultural elements with conflicting perceived values by stakeholders, as well as the increasing public concern for environmental management [20,21]. Recent work called for a deeper understanding of value plurality underlying the different positions held by various stakeholders to improve public support, avoid conflicts and convey legitimate information to integrate ES into spatial planning [22–24]. Stakeholders perceive value, demand and prioritize ES in different ways, which can be quantified as the social demand for ES [25]. However, assessing social demand can be useful for the identification of priority areas for integration into planning or potential conflicts among stakeholders [26].

It is essential for planners and policy makers to consider the perception of stakeholders to integrate ES into spatial planning to address not only ecological priorities but also social demand [27]. Policy makers should promote rural areas as not only working landscapes for agriculture but also as ecosystems with a broad range of services that contribute to human well-being in an equal manner [28,29]. In Switzerland, sustainable management of ES in rural areas is challenged because of complex administrative processes characterized by a decision-making process that is "layered" [30], and "fragmented" [31]. Currently, the concept of ES is poorly integrated into planning instruments [6]. Recent work attempted to integrate the economic concept of ES demand as the preferences people express for different ES under a budget constraint in an integrated modeling framework [32]. Agent-based modeling was used to model future demand and the resilience of social-ecological systems [33]. Despite previous research highlighting the importance of integrating ES demand in economic terms, to our knowledge, limited work attempted to understand the plurality of stakeholders' perceptions of ES under a spatial planning perspective in Switzerland.

This study aims at assessing stakeholder perspectives on ES to facilitate their integration into spatial planning. The specific objectives are: (i) To identify relevant stakeholders through stakeholder analysis, (ii) to characterize stakeholders' perceptions of the importance of ES for spatial planning, and (iii) to discuss the implications for spatial planning. We used stakeholder analysis followed by Q methodology to identify key stakeholder's values, or social demand, associated with ES to improve their management. Q-methodology is a tool for discourse analysis that combines both quantitative and qualitative data through statistical analysis to explore different opinions that exist about a topic [34].

2. Methodology

2.1. Study Site

The canton of Vaud is located in the western, French-speaking part of Switzerland, with a population of 767,497 inhabitants in 2015 (Figure 1) [35].

It has a total surface area of 321,224 ha. In past decades, the canton has undergone a large urbanization trend with the extent of urban areas increasing from 24,000 ha to 32,143 ha, while the extent of agricultural areas decreased by 9858 ha. Although the canton has the second-largest quota of arable land in Switzerland, according to its urbanization trend, its total surface area decreased from 77,718 ha in 1979/1981 to 70,039 ha in 2012/2014. As such, urbanization is ongoing mainly on productive agricultural areas. The opposite is observed for wooded areas as their extent increased by 2656 ha, mainly in mountainous regions in the eastern and western parts of the canton, at the expense

of alpine pastures [36]. Changes in land use triggered different variations in ES supply and led to trade-offs over time, which should be mitigated. The concept of ES accesses the same thematic areas as spatial planning, so both could complement each other to organize landscapes, land-use, urbanization and the use of natural resources [9].

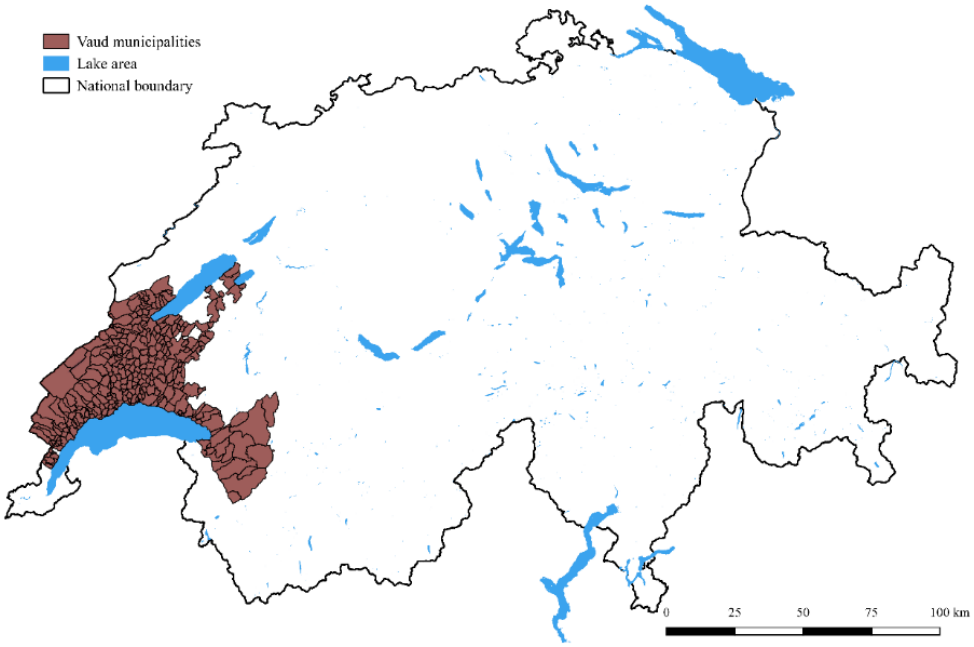

Figure 1. Administrative boundaries of municipalities in the canton of Vaud.

2.2. Q-Methodology

Gathering stakeholders' perspectives on ES required a participatory approach. Participatory methodologies of monetary or non-monetary valuation of ES usually ask participants to choose from a variety of answers, which are associated with subjective beliefs, before ranking them or scoring them. The researcher will often loose individual and personal position by using basic statistical analysis such as averaging. Measuring subjectivity in a structured away, while preserving individual data can be done with the Q methodology [34,37]. The methodology is useful to reveal patterns between stakeholders across a sample of variables, in contrast to a standard survey approaches or semi-structured interviews that see patterns among variables across a sample of participants [38]. The objective is to use variance analysis in Q methodology combined with correlation analysis among statements (Q-set) to prioritize ES for spatial planning by the person-sample or stakeholders (P-set) with varying perspectives. The method involves the following steps: Developing diverse statements on a subject (Q-statements), asking participants from the P-set to sort these statements following a quasi-normal distribution during individual interviews (Q-sorts), and examining the relationships among Q-sorts using inverted factor analysis and extracting the dominant factors [34]. We note that the limitations of the methods are discussed in Section 4.3.

2.2.1. Q-Set

The statements were pre-prepared by the authors to cover eleven ES mapped in previous work [15]. The selection fell into the CICES framework version v4.3 [39]. Each ES was translated into three statements that could capture individual perception in the specific local context. The statements can be derived from a broad range of sources, including peer-reviewed literature, grey literature, direct interviews, and personal opinions [40]. All these sources were investigated during the generation of the Q-set. We derived 33 initial Q-statements (three for each service to avoid over-representation of one service over another) based on previous Q-studies on people's perception of ecosystem

services [21,27,41]. In addition, interviews used in the selection of ES [15], and cultural values were elicited in Switzerland using a participatory approach [42]. We pilot-tested the Q-set with 10 researchers in the field to make sure that they were sufficiently clear and relevant. The result of this process was a set of 33 statements, which were presented to individual stakeholders from the P-set (Table 1).

2.2.2. P-Set

The objective was to identify the main stakeholder groups that are relevant to ES management and spatial planning in the study area. Stakeholder analysis is characterized by two main stages [43]: (i) Identification of stakeholders, and (ii) analytical categorization of stakeholders. The steps can vary based on the purposes of the analysis, and the variables used in the classification systems such as power, proximity or interests [44,45]. Considering the dependence on ES and the relevance in the decision-making process, the main categories of stakeholders are primary stakeholders and secondary stakeholders. Shepherd [46] describes primary stakeholders as those who are most dependent upon ES, and most likely to take an active part in managing them. Secondary stakeholders are over-powerful voices that may include local government officials who live near ES but do not greatly depend on it or those who depend on it but have a low degree of influence such as farmers, tourists and international conservation organizations.

Table 1. Thirty-three Q-statements of ecosystem services.

CICES Category	Ecosystem Service	N°	Statement
Regulating	Carbon stock	20	Ecosystems help regulate climate by sequestering carbon dioxide
		4	Ecosystems are green lungs for urban areas
		33	The role of soils is as important to store carbon as one of forests
	Flood regulation	12	Ecosystems moderate weather events and maintain river channel stability
		26	The influence of ecosystems on flood reduction plays a role before its occurrence and after its formation
		6	Ecosystems regulate river discharge and help achieve flood damage reduction at the lowest costs
	Erosion control	19	Ecosystems support the vegetation that protects soils from washing out
		23	Ecosystems prevent soils from washing out and ensures their fertility and productivity
		5	Ecosystems protect soils from erosion, which facilitates crop management and sustains homogenous crops
	Water purification	27	Water filtration by ecosystems can help maintain healthy aquatic habitat
		11	Water filtration by ecosystems is essential to get good drinking water quality
		32	Water filtration is linked to microbial diversity and natural land cover continuity
	Pollination	22	The state of biodiversity is essential to support the life of pollinators
		8	The activity of pollinators cannot be compensated by technology and plant-protection products
		18	Pollination supports many benefits such as the production of food, recreational opportunities, etc.
Provisioning	Food production	17	Ecosystems provide adequate grounds for intensive farming
		28	Croplands are the most essential component of food self-sufficiency in the region
		7	Crops may be dependent on other ecosystems but technology and plant-protection products could be substitutes

Table 1. *Cont.*

CICES Category	Ecosystem Service	N°	Statement
Cultural	Heritage	9	Ecosystems are strongly tied to local traditions and identity
		31	Ecosystems encourage a sense of community and transmission between people
		13	Ecosystems are crucial to pass down traditions to future generations
	Landscape aesthetics and landmark	10	Ecosystems reflect the beauty of nature
		24	Ecosystems allow to unwind in beautiful landscapes
		16	The structure of the underlying landscape appears in a beautiful way in the canton
	Outdoor activities	30	Ecosystems are a good place to exercise (e.g., running, cycling, skiing)
		2	Ecosystems are a good place to sit or walk (e.g., lunch, reading, dog walking)
		21	Tourists attracted by ecosystems in the canton benefit the region
	Inspiration, spiritual and religious	3	Ecosystems help to have a creative activity (painting, writing, playing music)
		14	Ecosystems help to get new professional or creative ideas
		25	Ecosystems are important constituents of religious beliefs
	Simple nature value	1	It is joy to know that ecosystems are being protected
		29	There is no substitute for being physically connected to ecosystems
		15	Ecosystems' functioning can be used as an example for human societies (e.g., biomimetic)

Identification of Stakeholders

We split the stage of stakeholder identification in two steps to build an iterative process [9,45]. First, the first list of 14 stakeholders is set based on three information sources: Our research group, name request to key informants, as well as the grey literature. The criteria used to make the first list of stakeholders are (i) the dependence on the ES (or stake in ES trade-offs), and (ii) the proximity with the services in order to consider mainly local stakeholders. Second, previously unknown stakeholders were identified with a snowball sampling approach, in which initial stakeholders provide additional people to take part in the study [47]. The initial group of primary stakeholders was administered a short questionnaire during the interview where they identified unknown stakeholders who were relevant to the study from their involvement in ES trade-offs and the decision-making process. Overall, 29 secondary stakeholders were identified, and 18 accepted to take part in the study. To avoid bias, no pre-defined list of stakeholder categories was proposed, and the number of stakeholders was not limited.

Categorization of Stakeholders

Stakeholders identified in the previous stage are divided into seven groups: "Nature conservation", "agriculture", "forestry", "planning", "academia", "tourism" and "residents". The secondary screening was required to make sure that all the stakeholders were allocated to the proper stakeholder groups.

There are varying views on the number of participants in Q methodology. While some studies sampled more than 60 participants [20,40,48], others argued that fewer participants than the number of statements in the Q-set are adequate [41,49,50]. For the purpose of this study, a medium number of participants was considered sufficient to be confident that the breadth of viewpoint within each stakeholder group was captured. Thirty-two stakeholders were selected based on the stakeholder analysis (14 primary and 18 secondary stakeholders), in line with previous work [27,49,51]. We note that two stakeholders could not due to the exercise at the time, bringing the total number of participants to 30. We conducted 45 min to 60 min long, individual face-to-face interviews.

2.2.3. Interview and Q-Sorts

Before the interviews, the participants were given an explanation about the purpose of the study and the categories of ES (Table 1). The second and main part of the interview was the Q-sorting phase where the quantitative data was generated. The participants were asked to sort the 33 statements, based on their priorities for spatial planning. Each statement was printed on a separate card and numbered randomly for further analysis. To reduce the cognitive burden, they were asked to classify the statements in three main categories: Those that they disagreed with, those that they agreed with, and neutral. Then the participants placed statements from each pile on a board representing a quasi-normal distribution on a nine-points scale from −4 to +4 (i.e., disagree to agree). The board contained the exact number of statements in the Q-set (Figure 2). The participants first placed the cards from the pile "disagree", and consecutively until they ran out of cards to create a Q-sort. The last part of the interview focused on gathering qualitative data to help interpret the Q-sorts, in which the participants were asked to discuss the reasoning for ranking the statements in the way they did. They were also asked if they would have sorted the statements differently in consideration of another context than the canton of Vaud. Follow-up questions aimed to establish whether they thought anything was missing or whether they wanted to comment on the statements.

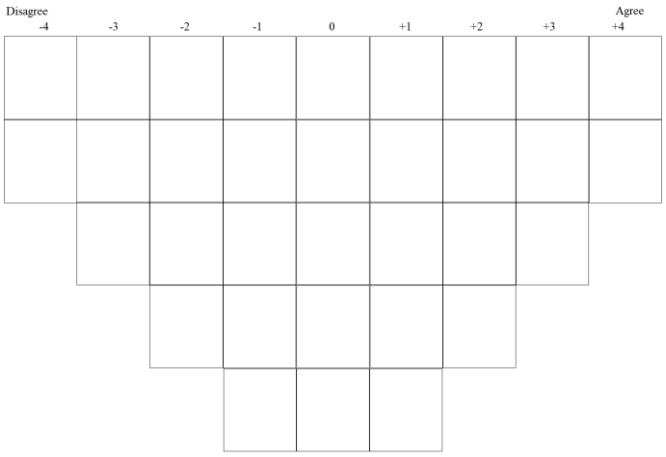

Figure 2. Q-methodology grid.

The data were analyzed using the software PQMETHOD (version 2.35) [52] by conducting by-person factor analysis, incorporating Varimax rotation to help eliminate noise [53]. It enables the identification of natural groupings of Q-sorts, or rankings, according to similarities and dissimilarities between respondents. The Q-sorts that load significantly onto a particular factor suggest that they exhibit a similar pattern of sorting and represent similar viewpoints. Therefore, a factor represents shared values and understanding among respondents [54]. We note that the grouping could be different than the stakeholder categorization conducted initially. The rankings can also be non-significant (i.e., not loaded significantly onto any factors) or confounded (i.e., loaded significantly onto more than one factor). Principal component analysis (PCA) was used to categorize all Q sorts by the factors identified [50]. Based on Watts and Stenner [55], we decided which factors should be selected for interpretation based on two criteria. The factor had to have an eigenvalue >1 and at least two Q sorts that loaded significantly upon it alone. In that respect, three factors were selected for analysis. An "ideal" ranking for each factor was generated from a weighted average. The ranking included all the statements that loaded significantly on that factor, and the score of these statements (from −4 to +4) (Table 2), allowing comparison and interpretation of each factor.

Table 2. Statements comprising the Q-set, their respective rank, and *z*-scores for each perspective. The most important statements within the perspectives are indicated by higher or lower rank and *z*-scores. Statements with red *z*-scores received lower scores and are considered less important. Statements with green *z*-scores received higher scores and can be considered more important. Distinguishing statements are indicated next to the particular *z*-scores for each of the perspectives (* for *p*-value < 0.05, ** for *p*-value < 0.01). Bold rank and *z*-scores indicate statement were high levels of agreement among the perspectives.

CICES Category	ES	Statement	*Utilitarian*		*Cultural*		*Protective*	
			Rank	***z*-Score**	**Rank**	***z*-Score**	**Rank**	***z*-Score**
Regulating	Carbon stock	Ecosystems help regulate climate by sequestering carbon dioxide	**2**	**1.01**	**2**	**0.90**	**1**	**0.65**
		Ecosystems are green lungs for urban areas	0	0.3 *	2	0.88	2	1.16
		The role of soils is as important to store carbon as one of the forests	2	1.0 *	1	0.46 *	−2	−0.61 **
	Flood regulation	Ecosystems moderate weather events and maintain river channel stability	1	0.75 *	4	1.43	3	1.33
		The influence of ecosystems on flood reduction plays a role before its occurrence and after its formation	**0**	**0.17**	**0**	**−0.04**	**0**	**−0.12**
		Ecosystems regulate river discharge and help achieve flood damage reduction at the lowest costs	**1**	**0.82**	**1**	**0.26**	**1**	**0.40**
	Erosion control	Ecosystems support the vegetation that protects soils from washing out	**2**	**1.03**	**3**	**1.31**	**3**	**1.31**
		Ecosystems prevent soils from washing out and ensures their fertility and productivity	1	0.82 **	4	1.80 **	1	0.15 **
		Ecosystems protect soils from erosion, which facilitates crop management and sustains homogenous crops	1	0.38	−1	−0.33	0	0.12
	Water purification	Water filtration by ecosystems can help maintain healthy aquatic habitat	3	1.31 *	0	0.2 *	2	0.76 *
		Water filtration by ecosystems is essential to get good drinking water quality	4	1.38 **	−2	−1.05 **	2	0.75 **
		Water filtration is linked to microbial diversity and natural land cover continuity	3	1.19 **	0	0.01	−1	−0.22
	Pollination	The state of biodiversity is essential to support the life of pollinators	4	1.595	2	0.76 **	4	1.75
		The activity of pollinators cannot be compensated by technology and plant-protection products	1	0.92 **	−1	−0.37 **	4	1.98 **
		Pollination supports many benefits such as the production of food, recreational opportunities, etc.	**3**	**1.14**	**3**	**1.14**	**2**	**0.89**

Table 2. *Cont.*

CICES Category	ES	Statement	*Utilitarian*		*Cultural*		*Protective*	
			Rank	***z*-Score**	**Rank**	***z*-Score**	**Rank**	***z*-Score**
Provisioning	Food production	Ecosystems provide adequate grounds for intensive farming	−1	−0.66 *	−4	−1.86 *	−3	−1.18 *
		Croplands are the most essential component of food self-sufficiency in the region	2	1.08 **	−3	−1.18	−3	−1.59
		Crops may be dependent on other ecosystems, but technology and plant-protection products could be substitutes	−3	−1.19	−3	−1.45	−4	−1.93
Cultural	Heritage	Ecosystems are strongly tied to local traditions and identity	−3	−1.10 **	−1	−0.44	−1	−0.45
		Ecosystems encourage a sense of community and transmission between people	−2	−1.01 **	0	−0.09	0	−0.10
		Ecosystems are crucial to pass down traditions to future generations	−1	−0.86	−3	−1.17	0	−0.1 **
	Landscape aesthetics	Ecosystems reflect the beauty of nature	0	−0.5	1	0.43 **	−1	−0.52
		Ecosystems allow to unwind in beautiful landscapes	0	−0.23	1	0.53 *	−1	−0.16
		The structure of the underlying landscape appears in a beautiful way in the canton	−1	−0.62	−1	−0.33	−3	−1.51 **
	Outdoor activities	Ecosystems are a good place to exercise (e.g., running, cycling, skiing)	−2	−0.91 **	2	1.13 **	−4	−1.61 **
		Ecosystems are a good place to sit or walk (e.g., lunch, reading, dog walking)	−1	−0.80	3	1.35 **	−2	−0.65
		Tourists attracted by ecosystems in the canton benefit the region	−1	−0.78	−2	−0.45	1	0.17 *
	Inspiration, spiritual, religious	Ecosystems help to have a creative activity (painting, writing, playing music)	−2	−1.02 *	1	0.43 **	−1	−0.53 *
		Ecosystems help to get new professional or creative ideas	−2	−0.87	−2	−0.7	0	−0.15
		Ecosystems are important constituents of religious beliefs	−4	−1.92 **	−4	−2.40 *	−2	−0.67 **
	Simple nature value	It is a joy to know that ecosystems are being protected	0	−0.11	−1	−0.21	−2	−0.96 **
		There is no substitute for being physically connected to ecosystems	−3	−1.04 **	0	0.04 **	3	1.4 **
		Ecosystems' functioning can be used as an example for human societies (e.g., biomimetic)	−4	−1.29	−2	−1.01	1	0.26 **

To facilitate cross-factor comparisons the total weighted scores were standardized into *z*-scores. It allows to detangle which statements are "consensus statements" (not statistically distinguishable between the two factors at p-value > 0.05) and "distinguishing statements" (statistically distinguishable between the two factors at p-value < 0.05). For statements that are neither consensus nor distinguishing, no comparison is possible. The factors were interpreted with the aid of information during the interviews. Each factor is presented as a perspective, representing different viewpoints [38].

3. Results

Three factors explained 55% of the study variance and 29 of the 30 Q-sorts or rankings loaded significantly (p-value < 0.01) onto one of the three factors, suggesting three distinct viewpoints. Based on the factor analysis, we were able to identify three perspectives to represent the different viewpoints of the participants: Utilitarian, cultural, and protective. One Q-sort was not significant for any factor and was not included in any perspective. Ideal rankings were produced for each factor and presented in Table 2.

3.1. Consensus between Participants

The results did not demonstrate a high level of agreement between the participants with 5 of 33 statements classified as consensus statements, reflecting a poor level of agreement (Table 2). All consensus statements belonged to regulating ES showing that people tended to understand the role of ecosystems to regulate climate and weather perturbation. The positive scores associated with carbon sequestration showed that a consensus exists on the capacity of natural systems to mitigate anthropogenic emissions. In addition, the participants strongly agreed with the crucial role of pollination as a support of other environmental benefits. The agreement was also very strong on the positive role of vegetation to prevent soil erosion. Although two of the three statements related to the flood regulation service received general agreement, the average scores (0 or +1) demonstrate that the relative importance of the service was less clear for most participants. Finally, we note that there was no general agreement on the relative importance of provisioning and cultural ES.

3.2. Factor Interpretation

3.2.1. Factor A: Utilitarian Perspective

Factor A focused on utilitarian values of ecosystems in the canton of Vaud. Seventeen participants were significantly associated with the utilitarian perspective. They tended to highly agree with the link between ecosystems and their biological functions but less with ecosystems and their social functions. They emphasized the importance of regulating ES (Q-statements with a significant rank of +2 to +4), especially water purification and carbon stock (Table 2). They also considered that croplands were "the most essential component of food self-sufficiency in the region" but believed in that intensive farming and the use of agricultural land for animal husbandry was not a sustainable solution and should not be a priority in spatial planning. Despite that most participants did not feel that cultural ES should be prioritized compared to other services (Q-statements with a significant rank of −4 to −2), most also agreed that the focus should not be put on economic or recreation values of ecosystems. Although, some participants mentioned that ES supply cultural benefits to "avoid the society from being depressed", as well as the high potential in the canton to attract tourists due to its right geographical settings, they considered that these services should not be a priority in planning, as these were not essential to human survival. The average, non-significant rank of the landscape aesthetic service confirmed that respondents might not consider it essential in spatial planning. Respondents tended to agree that ecosystems should be protected fully instead of being used for outdoor activities, especially if they are strongly tied to the local economic system with heavy infrastructures like skiing.

Participants believed it is important to polarize the debate and making a clear distinction between what is urgent or not on a higher level. For example, they felt that the public should understand why agriculture and water filtration are more important than subjective cultural values.

3.2.2. Factor B: Cultural Perspective

Factor B focused on cultural values of ecosystems in the canton. Six participants were significantly associated with the cultural perspective. Participants were sensible to the issue of integration of cultural aspects in spatial planning, which bring strong benefits to the population, especially in urban areas. The perspective showed the importance of cultural ES, with a strong emphasis on outdoor activities (positive and significant rank). The slightly above average score of landscape aesthetics showed that landscape beauty could be a component of spatial planning but is less important than outdoor activities or some regulating ES. As participants associated with other perspectives, they strongly disagreed with the association between ecosystems and religious beliefs in the canton.

In addition, the perspective strongly emphasized the importance of some regulating ES such as erosion control (+4), the role of soils to store carbon (+2) and the link between biodiversity and pollination (+2) (Table 2). However, it tended to agree less on the relationship between water filtration and good water quality, suggesting that the respondents may think that grey infrastructures are more efficient than natural processes. Finally, the perspective demonstrated negative and significant scores for food production. Participant justified this choice as current agricultural practices are focused on productivity even though Switzerland will never be able to compete with neighboring countries (e.g., France or Italy) in terms of production potential.

3.2.3. Factor C: Protective Perspective

The protective perspective shared elements with the utilitarian perspective, but tended to diverge from the cultural perspective. Six participants were significantly associated with a protective perspective. The perspective recognized the need for ecosystems to exist and function properly as a priority. Then, if and only if, the two first conditions were met, should we consider gaining benefit from them. Therefore, the emphasis was put on simple nature value and regulating functions such as pollination, erosion control and water purification with significant positive scores (Table 2). Although it was acknowledged that ecosystems help to regulate climate, respondents believed in the importance of controlling greenhouse gas emissions in priority, which explains the non-significant and negative scores for the service of carbon storage.

In line with the cultural perspective, a strong negative score was recorded for food production. Participants considered current agricultural practices as mostly intensive with patches of cropland that failed to consider the need for extensive areas to allow for soil regeneration and maintain its quality. In addition, respondents also mentioned that the canton would not be self-sufficient alone. They suggested that food self-sufficiency should not be an objective for preserving arable land, but the soil quality should.

Cultural ES were considered less vital than others, but essential for well-being from a psychological perspective. A participant mentioned that "it would be unbearable to live in a place with no access (physical or not) to natural or semi-natural areas", explaining the mostly positive scores of the service of simple nature value (Table 2). However, we note the overall negative and significant ranks of landscape aesthetics and outdoor activities, which demonstrates their relatively low importance for the preservation of intrinsic nature values.

4. Discussion

4.1. Unraveling Stakeholder's Perspectives

Historical trajectories of ES in the canton of Vaud could be attributed to undervaluing the full range of ES provided by rural areas, and institutional practices that serve to limit broader stakeholder

engagement in planning decisions [15,29]. Unraveling the areas of agreement and disagreement as well as the main viewpoints of different stakeholders on the value of ES is important to develop planning policies and ensure a successful implementation [56]. We used Q methodology to identify key stakeholder's values, or social demand, associated with ES to improve their management. The stakeholders' perspectives were grouped into three main groups or perspectives: Utilitarian, cultural, and protective that showed some level of agreement but favored different management regimes.

The utilitarian perspective grouped almost 60% of the participants and highlighted two key messages. First, preserving services that are critical to human survival, such as regulating ES that mitigate climate change and protect against weather events, was dominating the responses. Although the cultural and protective perspectives provided a different rationale to prioritizing regulating ES as it highlighted the importance to protect biological functions without necessarily benefiting from them, the importance given to regulating ES, especially pollination, water purification, and erosion control, showed the need to consider and integrate synergies between ES. Pollination was deemed crucial for its role in food production and other services. However, other work has shown that while the contribution of wild bees to crop production is significant, service supply is restricted to a limited subset of bee species. Conserving the biological diversity of bees, therefore, requires more than just ES-based arguments [57]. One alternative could be a stronger legal framework to consider biodiversity in planning. For example, the number of legally binding protected areas for biodiversity is low, except important biotopes, and the state of protected wetlands is decreasing due to drying or nitrogen input [58]. Further research is required to address the better integration of biodiversity in planning.

However, there are clear diverging views on the priority given to food production. While the utilitarian perspective stressed that croplands were essential for food self-sufficiency in line with the Swiss policy that preserves the best arable land (i.e., surfaces d'assolement or land crop rotation areas), and the need for a progressive change in agricultural practices, the cultural and protective perspectives shared a different view. In both groups, the stakeholders mentioned the fallacy of considering that agricultural practices shift from intensive to sustainable when the use of inputs fertilizers decrease. They also stressed that farming remains intensive from the pressure it puts on soil natural functions due to crop rotations, fragmentation or field boundary management [59]. Current agriculture is focused on productivity, so the current legislation on crop rotation areas could be protecting land for intensive agriculture.

The second message from the utilitarian perspective was that cultural aspects should not be prioritized in planning, in opposing view with the cultural perspective, where cultural aspects were vital elements for well-being. Two reasons may explain the utilitarian responses. On the one hand, most cultural values are not related to ecosystems. Cultural heritage, traditions, and landscape aesthetics may be linked to human interventions in the landscape rather than undisturbed ecosystems. This view was shared by the three perspectives. Therefore, the place given to heritage and landscape aesthetics in planning may be overestimated [42]. On the other hand, cultural benefits such as outdoor activities are not essential for our survival, according to some stakeholders [60]. It is also believed that people would perform outdoor activities regardless of human interventions. Natural systems require full protection instead of being used, sometimes in an intensive manner (e.g., skiing), suggesting a land-sparing approach [61]. A similar view on the need for protection was shared by the protective perspective. However, the perspective highlighted that humans need to live in harmony with nature instead of differencing uses, suggesting a land-sharing approach [61].

4.2. Implications for Spatial Planning

In general, stakeholders tended to agree that regulating services should not be provided by other means than by natural or semi-natural ecosystems. A service that cannot be provided naturally is a direct consequence of inadequate land use. Therefore, ecosystem multifunctionality and synergies should be integrated into planning. However, this requires that current trade-offs are addressed and mitigated [15].

Based on the findings and stakeholder's perspectives, a paradigm change in the food production system would be needed, moving away from a productive-only approach, to a system that protects soils and preserves their functions. Demand is changing to promote local and organic products [62,63]. Switzerland may have a leading role to play either in the ban of pesticides and/or experiencing new modes of agriculture (agro-ecology). It could also reduce the use of arable land for fodder production as half of the arable land is currently used for fodder production [64]. For example, a change in the current paradigm could be the integration of the term "self-production" instead of self-sufficiency, as Switzerland is unlikely to become fully self-sufficient if current imports of food, fodder, petrol, and fertilizers are considered [64].

The current political framework with the sectorial plan on crop rotation areas should not impeding this transition. Some stakeholders may advocate that the Forest law has also been a determinant of agricultural land losses in the canton in the past decade. However, the forest grows mainly on abandoned pastures, and remains stable as well as becomes more fragmented in the Plateau region [65]. As a stakeholder suggested, one way to avoid conflict between the forestry and agricultural sectors would be to integrate forestry-related infrastructures into wooded areas instead of using agricultural land. Although, the current political context offering protection to arable land and forests may not be suitable to minimize trade-offs between all service categories [15], the authors suggest that crop rotation areas could receive the same protection level as forests, providing a paradigm change, based on the importance given by the stakeholders to crop rotation areas and limiting intensive farming. More emphasis should be put on soil quality, as well as maintaining production knowledge (farming techniques and a large variety of crops). Higher authorities at the federal level could be in charge of helping farmers change their ways and regulate the sector. For example, incentives and guarantees coming from the federal government for farmers that are willing to change their practices may be a good option in addition to current ecological payments [66].

Finally, most participants considered cultural aspects as important, but with negative impacts on the environment. It demonstrates the possible overestimation of the importance of cultural ES in current planning policies, especially for outdoor activities and landscape aesthetics. The stakeholders could be ready to give away their privileges in terms of outdoor activities and aesthetics values to safeguard biological functions. For example, a swift change from winter-based tourism based on heavy infrastructures and sprawl, to soft/eco-friendly tourism that is more evenly split between the seasons could be an option. However, further research is required on the type of tourism the public would prefer to limit negative impacts on the environment

4.3. Methodological Considerations

The authors used Q-methodology, alongside stakeholder analysis, to reveal people's perspectives on the integration of ES into spatial planning in the canton of Vaud. This approach is useful to understand the different viewpoints in a specific context, but it also has shortcomings. First, it does not allow for generalizations, and the results would not be applicable to other cantons in Switzerland. In addition, the selection of Q-statements is inherently subjective, as there are no standards for their selection [50]. Despite that the participant sample is of moderate size (n = 30), the authors believe that the inclusion of various stakeholders, and testing the Q-statements, has helped to provide a good overview of the range of perspectives within the planning debate.

Second, the given Q-statements and the forced normal distribution can give participants the feeling that they cannot express freely their view [21]. The authors tried to address this during the interview by assisting the participants with the statement meaning and stressing that there were no wrong or right answers in this prioritization exercise.

5. Conclusions

The concept of ES is considered complementary to current spatial planning practices, but the benefits provided by natural and land systems were often underestimated in planning decisions.

Although the assessment of ES supply is key towards the integration of ES in spatial planning, recent work called for a deeper understanding of social demand and value plurality underlying the different positions held by various stakeholders. This study explores the different stakeholder perspectives on ES to facilitate their integration into spatial planning in the canton of Vaud in Switzerland. Q-methodology was applied to reveal three dominant perspectives: Utilitarian, cultural, and protective.

Although the low level of agreement between the perspectives demonstrated that different management regimes were favored by the participants, three key elements integrate aspects discussed by the three perspectives and could have implications for spatial planning in the canton.

First, stakeholders tended to agree that ES should primarily be provided by natural or semi-natural ecosystems. Therefore, ecosystem multifunctionality and synergies should be integrated into planning.

Second, Switzerland could have a leading role to play in the change of the food production system, moving away from a productive-only approach, to a system that protects soils and preserves their functions. The current political framework with the sectorial plan on crop rotation areas would not impede this transition. Providing a paradigm change, arable land could be protected to the same level as forests and farmers could be incentivized further to change their practices, in addition to current ecological payments.

Finally, cultural aspects were important, but with few negative impacts on the environment. The importance placed on regulating ES rather than cultural ES revealed that an emphasis on cultural ES, such as outdoor activities and landscape aesthetics, could be counterproductive in the protection of other ES. According to the participants, cultural ES should be a priority only if ecological functions are protected.

To explore further the gap between various stakeholder's perspectives, it would be useful to conduct a similar study in another canton in Switzerland and compare the results to understand if similar suggestions for spatial planning could be drawn at a higher planning level.

Author Contributions: R.J. conceived the presented idea and drafted the manuscript. J.C. provided supervision, critical revisions and validation from the methodology.

Funding: This research received no external funding.

Acknowledgments: This research would not have been possible without the help of the participants who gave some of their time for the completing of this work, including colleagues from the Urban and Regional Planning community at EPFL.

Conflicts of Interest: The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

References

1. Wu, J. Urban ecology and sustainability: The state-of-the-science and future directions. *Landsc. Urban Plan.* **2014**, *125*, 209–221. [CrossRef]
2. Albert, C.; Aronson, J.; Fürst, C.; Opdam, P. Integrating ecosystem services in landscape planning: Requirements, approaches, and impacts. *Landsc. Ecol.* **2014**, *29*, 1277–1285. [CrossRef]
3. Rozas-Vásquez, D.; Fürst, C.; Geneletti, D.; Almendra, O. Integration of ecosystem services in strategic environmental assessment across spatial planning scales. *Land Use Policy* **2018**, *71*, 303–310. [CrossRef]
4. Cortinovis, C.; Geneletti, D. Ecosystem services in urban plans: What is there, and what is still needed for better decisions. *Land Use Policy* **2018**, *70*, 298–312. [CrossRef]
5. Hein, L.; van Koppen, C.K.; van Ierland, E.C.; Leidekker, J. Temporal scales, ecosystem dynamics, stakeholders and the valuation of ecosystems services. *Ecosyst. Serv.* **2016**, *21*, 109–119. [CrossRef]
6. Jaligot, R.; Chenal, J. Integration of Ecosystem Services in Regional Spatial Plans in Western Switzerland. *Sustainability* **2019**, *11*, 313. [CrossRef]
7. Gómez-Baggethun, E.; Martín-López, M.; Barton, D.; Braat, L.; Saarikoski, H.; Kelemen, M.; García-Llorente, M.; van den Bergh, J.; Arias, P.; Berry, P.; et al. *EU FP7 OpenNESS Project Deliverable 4.1, State-of-the-Art Report on Integrated Valuation of Ecosystem Services*; European Commission: Brussels, Belgium, 2014.

8. Pandeya, B.; Buytaert, W.; Zulkafli, Z.; Karpouzoglou, T.; Mao, F.; Hannah, D.M. A comparative analysis of ecosystem services valuation approaches for application at the local scale and in data scarce regions. *Ecosyst. Serv.* **2016**, *22*, 250–259. [CrossRef]
9. Turkelboom, F.; Leone, M.; Jacobs, S.; Kelemen, E.; García-Llorente, M.; Baró, F.; Termansen, M.; Barton, D.N.; Berry, P.; Stange, E.; et al. When we cannot have it all: Ecosystem services trade-offs in the context of spatial planning. *Ecosyst. Serv.* **2018**, *29*, 566–578. [CrossRef]
10. Jopke, C.; Kreyling, J.; Maes, J.; Koellner, T. Interactions among ecosystem services across Europe: Bagplots and cumulative correlation coefficients reveal synergies, trade-offs, and regional patterns. *Ecol. Indic.* **2015**, *49*, 46–52. [CrossRef]
11. Maes, J.; Teller, A.; Erhard, M.; Liquete, C.; Braat, L.; Berry, P.; Egoh, B.; Puydarrieux, P.; Fiorina, C.; Santos, F.; et al. Mapping and Assessment of Ecosystems and their Services. *Anal. Framew. Ecosyst. Assess. Action* **2013**, *5*, 1–58. [CrossRef]
12. Rabe, S.E.; Gantenbein, R.; Richter, K.F.; Grêt-Regamey, A. Increasing the credibility of expert-based models with preference surveys—Mapping recreation in the riverine zone. *Ecosyst. Serv.* **2018**, *31*, 308–317. [CrossRef]
13. Allan, E.; Manning, P.; Alt, F.; Binkenstein, J.; Blaser, S.; Blüthgen, N.; Böhm, S.; Grassein, F.; Hölzel, N.; Klaus, V.H.; et al. Land use intensification alters ecosystem multifunctionality via loss of biodiversity and changes to functional composition. *Ecol. Lett.* **2015**, *18*, 834–843. [CrossRef] [PubMed]
14. Bradford, M.A.; Wood, S.A.; Bardgett, R.D.; Black, H.I.; Bonkowski, M.; Eggers, T.; Grayston, S.J.; Kandeler, E.; Manning, P.; Setälä, H.; et al. Discontinuity in the responses of ecosystem processes and multifunctionality to altered soil community composition. *Proc. Natl. Acad. Sci. USA* **2014**, *111*, 14478–14483. [CrossRef] [PubMed]
15. Jaligot, R.; Chenal, J.; Bosch, M. Assessing spatial temporal patterns of ecosystem services in Switzerland. *Landsc. Ecol.* **2019**, 1–16. [CrossRef]
16. Spash, C.L. The shallow or the deep ecological economics movement? *Ecol. Econ.* **2013**, *93*, 351–362. [CrossRef]
17. Stosch, K.C.; Quilliam, R.S.; Bunnefeld, N.; Oliver, D.M. Quantifying stakeholder understanding of an ecosystem service trade-off. *Sci. Total Environ.* **2019**, *651*, 2524–2534. [CrossRef]
18. Castro, A.J.; García-Llorente, M.; Martín-López, B.; Palomo, I.; Iniesta-Arandía, I. Multidimensional Approaches in Ecosystem Services Assessment. In *Earth Observation of Ecosystem Services*; Alcaraz-Segura, D., Di Bella, C.M., Straschnoy, J.V., Eds.; Taylor & Francis Group, CRC: Boca Raton, FL, USA, 2013; pp. 105–124.
19. Castro, A.J.; Vaughn, C.C.; Julian, J.P.; García-Llorente, M. Social demand for ecosystem services and implications for watershed management. *J. Am. Water Resour. Assoc.* **2016**, *52*, 209–221. [CrossRef]
20. Armatas, C.A.; Venn, T.J.; Watson, A.E. Applying Q-methodology to select and define attributes for non-market valuation: A case study from Northwest Wyoming, United States. *Ecol. Econ.* **2014**, *107*, 447–456. [CrossRef]
21. Winkler, K.J.; Nicholas, K.A. More than wine: Cultural ecosystem services in vineyard landscapes in England and California. *Ecol. Econ.* **2016**, *124*, 86–98. [CrossRef]
22. Crouzat, E.; Arpin, I.; Brunet, L.; Colloff, M.J.; Turkelboom, F.; Lavorel, S. Researchers must be aware of their roles at the interface of ecosystem services science and policy. *Ambio* **2018**, *47*, 97–105. [CrossRef]
23. Martín-López, B.; Montes, C. Restoring the human capacity for conserving biodiversity: A social–ecological approach. *Sustain. Sci.* **2015**, *10*, 699–706. [CrossRef]
24. Turner, R.K.; Daily, G.C. The ecosystem services framework and natural capital conservation. *Environ. Resour. Econ.* **2008**, *39*, 25–35. [CrossRef]
25. Martín-López, B.; Gómez-Baggethun, E.; García-Llorente, M.; Montes, C. Trade-offs across value-domains in ecosystem services assessment. *Ecol. Indic.* **2014**, *37*, 220–228. [CrossRef]
26. Castro, A.J.; Verburg, P.H.; Martín-López, B.; Garcia-Llorente, M.; Cabello, J.; Vaughn, C.C.; López, E. Ecosystem service trade-offs from supply to social demand: A landscape-scale spatial analysis. *Landsc. Urban. Plan.* **2014**, *132*, 102–110. [CrossRef]
27. Buchel, S.; Frantzeskaki, N. Citizens' voice: A case study about perceived ecosystem services by urban park users in Rotterdam, the Netherlands. *Ecosyst. Serv.* **2015**, *12*, 169–177. [CrossRef]
28. Gutman, P. Ecosystem services: Foundations for a new rural–urban compact. *Ecol. Econ.* **2007**, *62*, 383–387. [CrossRef]

29. Lüscher, C. *Dix ans de Plan Sectoriel des Surfaces d'assolement: Expériences des Cantons, Attentes Envers la Confédération*; ARE: Berne, Switzerland, 2003.
30. Messer, M.A.; Bonroposi, M.; Chenal, J.; Hasler, S.; Niederoest, R. Gérer Les Meilleures Terres Agricoles En Suisse Pratiques Cantonales Et Perspectives D'évolution—Rapport Final. 2016. Available online: https://infoscience.epfl.ch/record/218371/files/RAPPORT%20FINAL-FR.pdf (accessed on 23 March 2017).
31. Hersperger, A.M.; Mueller, G.; Knöpfel, M.; Siegfried, A.; Kienast, F. Evaluating outcomes in planning: Indicators and reference values for Swiss landscapes. *Ecol. Indic.* **2017**, *77*, 96–104. [CrossRef]
32. Brunner, S.H.; Huber, R.; Grêt-Regamey, A. A backcasting approach for matching regional ecosystem services supply and demand. *Environ. Model. Softw.* **2016**, *75*, 439–458. [CrossRef]
33. Grêt-Regamey, A.; Huber, S.H.; Huber, R. Actors' diversity and the resilience of social-ecological systems to global change. *Nat. Sustain.* **2019**. [CrossRef]
34. Brown, S.R. Q methodology and Qualitative Research. *Qual. Health Res.* **1996**, *6*, 561–567. [CrossRef]
35. Statistique Vaud. Districts et Communes: Autres Tableaux. 2017. Available online: http://www.scris.vd.ch/Default.aspx?DomId=33 (accessed on 15 December 2018).
36. Swiss Federal Statistical Office (SFSO). L'utilisation du sol en Suisse: Exploitation et Analyse. 2015. Available online: https://www.bfs.admin.ch/bfs/fr/home/statistiques/espace-environnement/utilisation-couverture-sol.assetdetail.349275.html (accessed on 25 May 2018).
37. Stephenson, W. *The Study of Behaviour: Q-Technique and Its Methodology*; American Psychological Association: Washington, DC, USA, 1953.
38. Barry, J.; Proops, J. Seeking sustainability discourses with Q methodology. *Ecol. Econ.* **1999**, *28*, 337–345. [CrossRef]
39. Haines-Young, R.; Potschin, M. *Common International Classification of Ecosystem Services (CICES): Consultation on Version 4, August-December 2012*; EEA Framework Contract No EEA/IEA/09/003; University of Nottingham: Nottingham, UK, 2013.
40. Pike, K.; Wright, P.; Wink, B.; Fletcher, S. The assessment of cultural ecosystem services in the marine environment using Q methodology. *J. Coast. Conserv.* **2015**, *19*, 667–675. [CrossRef]
41. Bredin, Y.K.; Lindhjem, H.; van Dijk, J.; Linnell, J.D. Mapping value plurality towards ecosystem services in the case of Norwegian wildlife management: AQ analysis. *Ecol. Econ.* **2015**, *118*, 198–206. [CrossRef]
42. Jaligot, R.; Hasler, S.; Chenal, J. National assessment of cultural ecosystem services—Participatory mapping in Switzerland. *Ambio* **2018**, 1–15. [CrossRef] [PubMed]
43. Reed, M.S.; Graves, A.; Dandy, N.; Posthumus, H.; Hubacek, K.; Morris, J.; Prell, C.; Quinn, C.H.; Stringer, L.C. Who's in and why? A typology of stakeholder analysis methods for natural resource management. *J. Environ. Manag.* **2009**, *90*, 1933–1949. [CrossRef] [PubMed]
44. Gass, G.; Biggs, S.; Kelly, A. Stakeholders, science and decision making for poverty-focused rural mechanization research and development. *World Dev.* **1997**, *25*, 115–126. [CrossRef]
45. Paletto, A.; Hamunen, K.; De Meo, I. Social network analysis to support stakeholder analysis in participatory forest planning. *Soc. Nat. Resour.* **2015**, *28*, 1108–1125. [CrossRef]
46. Shepherd, G. *The Ecosystem Approach: Five Steps to Implementation*; IUCN: Gland, Switzerland; Cambridge, UK, 2004; 30p.
47. Harrison, S.R.; Qureshi, M.E. Choice of stakeholder groups and members in multicriteria decision models. *Nat. Resour. Forum* **2000**, *24*, 11–19. [CrossRef]
48. Calvet-Mir, L.; Gómez-Baggethun, E.; Reyes-García, V. Beyond food production: Ecosystem services provided by home gardens. A case study in Vall Fosca, Catalan Pyrenees, Northeastern Spain. *Ecol. Econ.* **2012**, *74*, 153–160. [CrossRef]
49. Hermelingmeier, V.; Nicholas, K.A. Identifying five different perspectives on the ecosystem services concept using Q methodology. *Ecol. Econ.* **2017**, *136*, 255–265. [CrossRef]
50. Webler, T.; Danielson, S.; Tuler, S. *Using Q Method to Reveal Social Perspectives in Environmental Research*; Social and Environmental Research Institute: Greenfield, MA, USA, 2009; Available online: https://www.researchgate.net/profile/Stentor_Danielson/publication/273697977_Using_Q_Method_to_Reveal_Social_Perspectives_in_Environmental_Research/links/582a4e1608aef19cb805583d/Using-Q-Method-to-Reveal-Social-Perspectives-in-Environmental-Research.pdf (accessed on 1 June 2019).
51. Lee, J.H.; Kim, M.; Kim, B.; Park, H.J.; Kwon, H.S. Performing Ecosystem Services at Mud Flats in Seocheon, Korea: Using Q Methodology for Cooperative Decision Making. *Sustainability* **2017**, *9*, 769. [CrossRef]

52. Schmolck, P. The Q-method Page. 2014. Available online: http://schmolck.userweb.mwn.de/qmethod/index.htm (accessed on 1 June 2019).
53. Brown, S.R. *Political Subjectivity Applications of Q Methodology in Political Science*; Yale University Press: New Haven, CT, USA, 1980.
54. Dziopa, F.; Ahern, K. A systematic literature review of the applications of Q-technique and its methodology. *Methodology* **2011**, *7*, 39–55. [CrossRef]
55. Watts, S.; Stenner, P. Doing Q methodology: Theory, method and interpretation. *Qual. Res. Psychol.* **2005**, *2*, 67–91. [CrossRef]
56. Raymond, C.M.; Singh, G.G.; Benessaiah, K.; Bernhardt, J.R.; Levine, J.; Nelson, H.; Turner, N.J.; Norton, B.; Tam, J.; Chan, K.M. Ecosystem services and beyond: Using multiple metaphors to understand human–environment relationships. *Bioscience* **2013**, *63*, 536–546. [CrossRef]
57. Kleijn, D.; Winfree, R.; Bartomeus, I.; Carvalheiro, L.G.; Henry, M.; Isaacs, R.; Klein, A.M.; Kremen, C.; M'gonigle, L.K.; Rader, R.; et al. Delivery of crop pollination services is an insufficient argument for wild pollinator conservation. *Nat. Commun.* **2015**, *6*, 7414. [CrossRef]
58. Birdlife. Strategie Biodiversität Schweiz des Bundesrates Wo steht die Umsetzung in der Schweiz 2017? 2017. Available online: https://www.birdlife.ch/sites/default/files/documents/Biodiversitaetsstrategie_Zielerreichung_2017.pdf (accessed on 1 June 2019).
59. Tscharntke, T.; Klein, A.M.; Kruess, A.; Steffan-Dewenter, I.; Thies, C. Landscape perspectives on agricultural intensification and biodiversity–ecosystem service management. *Ecol. Lett.* **2005**, *8*, 857–874. [CrossRef]
60. Small, N.; Munday, M.; Durance, I. The challenge of valuing ecosystem services that have no material benefits. *Glob. Environ. Chang.* **2017**, *44*, 57–67. [CrossRef]
61. Zarrineh, N.; Abbaspour, K.; van Griensven, A.; Jeangros, B.; Holzkämper, A. Model-Based Evaluation of Land Management Strategies with Regard to Multiple Ecosystem Services. *Sustainability* **2018**, *10*, 3844. [CrossRef]
62. Haller, T.; Crole-Rees, A.; Dumondel, M. Attitudes towards growing food in cities: The case of Lausanne, Switzerland. *J. Sociol. Econ. Agric.* **2013**, *6*, 201–223.
63. Porcher, N. L'agriculture contractuelle de proximité en Suisse romande. Master's Thesis, Institut Agronomique Méditerranéen de Montpellier, Monpellier, France, 2011.
64. Ferjani, A.; Mann, S.; Zimmermann, A. An evaluation of Swiss agriculture's contribution to food security with decision support system for food security strategy. *Br. Food J.* **2018**, *120*, 2116–2128. [CrossRef]
65. Loran, C.; Kienast, F.; Bürgi, M. Change and persistence: Exploring the driving forces of long-term forest cover dynamics in the Swiss lowlands. *Eur. J. For. Res.* **2018**, *137*, 693–706. [CrossRef]
66. Ferjani, A.; Zimmermann, A.; Reissig, L. L'agriculture biologique, mal acceptée en grandes cultures. *Recherche Agronomique Suisse* **2010**, *1*, 238–243.