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Article

Understanding Residents' Perceptions to Improve Park-People Relationships in Wuyishan National Park, China

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Abstract: A healthy park-people relation depends essentially on the fair and sustainable maintenance of rural livelihood. When protected area is designated, rural people may face restrictions of access to land and resource use for multiple ecosystem services. In Wuyishan of China, we analysed the role of traditional tea cultivation during consistent protected area management to find ways to maintain stability of this social-ecological system in the new national park era. We used an intensive social survey to investigate tea's role, perception of ecosystem services and impacts on tea cultivation from consistent conservation policies. Results showed that tea cultivation brought major household income and associated with multiple culture services. Protected area management affected land use and conservation outcomes were more obvious to farmers than economic and social ones. From the perspective of a social-ecological system, tea cultivation in national should be conservation-compatible activities from which the potentially lost economic value is remedied by ecological and cultural valorisation. To sustain the resilience of the social-ecological system, we proposed a three-scale management framework to regulate biophysical elements at land plot scale, to link production and market at the mountain level, and to secure tenure and encourage community participation at the landscape level.

Keywords: national park; social-ecological system; ecosystem services; tea cultivation; protected area management;

1. Introduction

In the management of a national park and other protected areas, a healthy park-people relationship depends essentially on the fair and sustainable maintenance of rural livelihood in the developing world [1]. Their livelihood is realised through the appreciation of multiple ecosystem services directly, or indirectly to benefit the local communities [2-4]. Ecosystem services link the natural system to human well-being, yet the provision of them is seldom solely natural, but part of a social-ecological system in which resource users interact with the environment to shape both the ecosystem and their culture [5]. People allocated meaning to many aspects of the ecosystem, which will lead to a perception of the ecosystem service or material as a benefit (positive meaning) or a perception that benefits are reduced (negative meaning). This perception will significantly affect their activities. For example, if local people perceive forests as a commodity, they may practice timber harvesting, but if perceived as natural beauty by others, recreational activities may be preferred [6]. Therefore, balancing multiple benefits of stakeholders will eventually have impacts on the provision of ecosystem services to many stakeholders in general, and local people's livelihood in specific. Furthermore, the perception of ecosystem services is highly context-dependent; any change of the biophysical or socio-economic conditions may lead to a change of resource users' behaviours because people modify their behaviour based on their knowledge and expectation concerning future changes [7]. This is obvious

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when new conservation policies and practices are applied in rural areas, where local people face uncertainty in livelihood and may take action to secure their benefit, thus affecting park-people relations. From agricultural systems adjacent to the protected area, local communities can provide ecosystem services beyond basic products to balance multiple benefits of stakeholders [8-9]. However, in populated protected areas where agricultural landscape matters to conservation outcomes, the concept of agriculture of multifunctionality was much less addressed as in rural development [10-13].

A healthy park-people relationship is especially important to current PA management in China, where the old PA systems are undergoing a fundamental change for more efficient conservation. A new National Park system is under construction after more than 60 years of PA management, to reform the current multi-headed management of various types of protected areas that are established by different sectors separately. The establishment of national parks is not only a process of unification of management units, but also an integration of adjacent protected areas for ecological integrity. The unification and integration bring in the new institution that affects both the geographical location of communities relative to protected areas, and the resource use of local people [14]. Thus, local community's livelihood is now a focus of national park management in China. Research abounds in the park-people relation that neglect of local culture and limit to access to resources significantly affect local community's satisfaction of park management [2, 15-17]. These rules may even raise the counter effect of resource exploitation for livelihood and lead to degradation of ecosystems and their capability of providing various ecosystem services [18-19]. Therefore, a healthy park-people relation which is firstly based on the distributional justice of benefits, is critical to the stability of the natural system as well as the final target of natural conservation. Considering the fast changes caused by PA reform, it is critical to regulating local people' activities regarding conservation goals without depriving them of their reasonable demand for ecosystem services, so that the whole system can maintain its stability both ecologically and socio-economically, i.e. resilience of the social-ecological system is maintained [20-21].

The tea cultivation system in the Wuyishan (Mt. Wuyi) national park was such a typical social-ecological system which is similar to many other systems in the developing countries to have evolved with long-term human-nature interaction [22]. Tea cultivation in the mountainous area interacts with the forest ecosystem to benefit not only locals but also domestic and international consumers and tourists. Tea cultivation can date back to 2000 years ago. The landform and micro-climate of the broadleaf forest have nurtured tea bushes to form a unique cultural landscape that bears not only natural values but also cultural meaning [22]. The role of humans in the past and present cannot be ignored in the study of the structure and function of the contemporary forest. For example, evidence from indigenous knowledge and management history confirmed that there was a synergy between tea bushes and natural forest [23], and the recent expansion of tea bushes and the intensification of land use can lead to forest degradation.

In the evolution of the cultural landscape in Wuyishan, rural households and individuals have responded to institutional change actively, especially to the land tenure system and the management of nature reserve (1979), scenic area (1982), world heritage site (1999) etc. during the past 40 years, in a good or bad way. A recent study shows that in the region of the past Nature Reserve, high tea leaf yield, more labour in a family can bring higher income [24]. However, now the communities making a living from tea cultivation face a new challenge. In 2015, the national park pilot was launched by integration and modification of the previously protected areas to improve forest ecosystem integrity. The spatial integration leads to the inclusion of more rural landscapes adjacent to the boundary of the pilot, making the role of people in the social-ecological system more prominent when new rules and regulations occur.

Most studies of perceptions and attitudes of local stakeholders are carried out in established PAs which have been operating for years. The perception of a PA in designation could differ from the perception of a long-established PA [25], and the integration of PAs for a new one has seldom been explored from the perspective of ecosystem services trade-

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offs among multiple stakeholders. When China is designing a new national park system, stakeholder participation is supposed to have more opportunity as it is officially promoted based on the experience with management in the past 40 years. To maintain a good park-people relationship in the newly designated national park, it is necessary to know rural individuals' perception of their territory and of its management history as the base of their activities and starting point of designing new rules.

Therefore, this paper investigates the rural communities that are engaged with tea cultivation and production in the Wuyishan national park pilot. The overall aim of the study is to assess the meaning of tea cultivation to the rural people and how it interacts with conservation to find ways to adapt tea cultivation to conservation for a sustainable and harmonious co-existence of the tea orchard and forest, so that the biodiversity and other regulating, supporting or cultural services that are required by different ecosystem services beneficiaries can be secured.

The research uses an intensive social survey by submitting a semi-structured questionnaire to a sample of tea farmers. The basic assumption of this approach is that the investigation of local communities' perception allows understanding and interpreting the human behaviours, because, during long-term interaction with nature, local communities have the ability to identify dynamic changes and multiple driving factors.

The paper will focus on three aspects: 1) to examine the role of tea role as a major income source and the critical factors to impact the economic outcomes; 2) to explore tea's role beyond economic significance through local communities' perceptions of multiple ecosystem services that are affiliated with the cultural landscapes; 3) to understand park-people relations from local communities' perception of protected area management and its impacts on the tea cultivation. The results reveal how tea cultivation link human to the social-economic, social-cultural and social-ecological world. Finally, the paper provides some answers to how to adapt tea cultivation to the conservation goals of a national park for a healthy park-people relationship. In order to promote benefit-sharing for the traditional production system in a modern world, the paper will propose an analytical framework concerning three levels: the plot level at which controlling and monitoring of biophysical elements are critical; the mountain level at which production and market are critical and the landscape level at which land tenure and management are critical. The study complements the findings of influences on the development of perception and behaviour for a better park-people relation and may serve as both an example to facilitate community participation to PA establishment in developing countries and further comparison with other cases which reveal park-people relations through the local perception of the ecosystem and its management around the world.

2. Materials and Methods

2.1 Study area

The Wuyishan National Park is located in Southeast China as a part of the Wuyi Mountains (Fig. 1). This national park is integrated from mainly three protected areas: the Wuyishan National Nature Reserve (NNR) to the west, the Nine-Bend Stream Ecological Protection Area (NEPA) in the centre and the Wuyishan National Scenic Area (NSA) to the east, with a total area of 982.59 km^2 after spatial optimization in its piloting period when the research was conducted.

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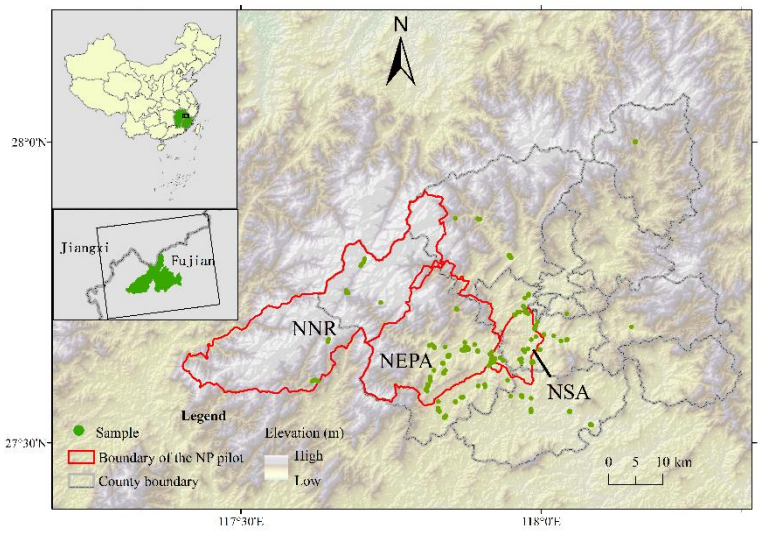

Figure 1. The location and composition of the Wuyishan national park (2015).

Archaeological remains suggested that people settled in the Wuyi Mountains as early as 4, 000 years ago. Some traditional livelihood activities, such as rice growing, bamboo collection, lumbering, and tea cultivation, have continued to modern times. People's productive interaction with nature has transformed the landscape and created rich cultural landscapes. The long-lasting tea cultivation dating back as least to the Tang Dynasty (618-907 AD) has created such a typical one. Wuyi Mountains not only have preserved the abundant humid subtropical forest, provided suitable habitats to endangered species such as *Liriodendron chinense* and *Halesia macgregorii*, but the biophysical and geological conditions also have nurtured tea bushes. People adapted to the natural conditions with their traditional wisdom to keep a delicate balance of the forest-tea system. For example, in the 16th century, farmers were able to build terraces for tea cultivation with a system of dykes and drains [26]. Until now, this rural landscape still generates multiple ecosystem services that benefit local well-being as a social-ecological system.

There are about 3 000 inhabitants inside the national park and another 20 000 settle within 2 km of the park boundary. Most of the tea farmers live along the upstream zone of the Nine-Bend Stream. Rural people keep transforming the landscape mainly through forest use [23]. In the past three decades, they have experienced the reform of collective forestry rights. Under this reform, the forest land was treated as "a bundle of rights" when the transaction and operation rights were under the control of individual households with a clarification of resource boundaries in the collective land tenure. This reform aims at stabilising land tenure and improving forestry efficiency, however, the flexibility without a full understanding of ecosystem multifunctions has led to monoculture plantation and forest degradation [27]. Meanwhile, a series of actions were also taken to protect the biodiversity and landscape in the form of the national nature reserve (1979) and the national scenic area (1982), which are generally prioritised for conservation and tourism, respectively. Wuyishan further entered the list of the UNESCO World Heritage Site as a mixed site because of its cultural value, natural beauty and biodiversity value in 1999. More land use policies were issued in the new millennium to regulate the human-forestland relations alongside the designation of protected areas, such as the ban on commercial logging in 2008, and the prohibition against the expansion of tea orchards in 2011. In addition, more forests were designated ecological forests. In the era of a national park, there was still returning tea orchard to forest when illegal planting was found. Therefore, Wuyishan national park faces the challenge of balancing productive land use and conservation especially along the river and around the boundary of protected areas, where the request for expansion of tea cultivation and tourism still exists.

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2.2 Survey and data analysis

A questionnaire was designed and submitted to a sample of tea farmers living in and adjacent to the national park (Fig. 1). The questionnaire was organised in different sections focusing on the following topics:

1) General data of respondents, such as age, gender, family size, labour force, annual household income, land use history, distance to tea orchards. Some of these variables concerning natural, human assets are designed to detect the impact factors of household income based on previous research [22,24].

2) Tea farmers' perception of the critical factors affecting the production of tea, in terms of the policy, market and natural conditions.

3) Tea farmers' preference and assessment of the importance of ecosystem services associated with the forest and how they value tea cultivation during the construction of a national park.

4) Tea farmers' perception of the efficiency of protected area management in terms of ecological, economic and public welfare outcomes, considering potential land use conflict between community livelihood and ecological protection targets.

The questionnaire contained open-ended questions for topics 2, 3 and 4 to form the major part of a semi-structured interview, and close-ended questions for topics 1 to 4 as a structured social survey. The respondents could answer "yes", "no" or "I don't know" to the closed questions; they could choose items all fitting their conditions from some multiple-choice questions; they could explain or provide examples to the open questions in detail. The interview and survey were conducted face-to-face by a team of trained volunteers from July 18th to 31st of 2016. In total, 221 tea farmers participated in the study, with ages ranging between 21 and 75. Most respondents answered all the questions. Only a few questions were left unanswered by very few people because they forgot certain numbers, did not like to comment or had no idea of certain information. This does not affect qualitative analysis due to information saturation. In the quantitative analysis, numbers of valid data (e.g., n=218) were provided to show how many people did not respond to certain questions.

Qualitative data collected from interview questions were analysed by using the key information, and following a grounded theory approach by using the open coding and axial coding to categorise and describe tea farmers' perception of the meaning of ecosystem services and tea cultivation under protected areas. Open coding is the process of decomposing, comparing, conceptualising and categorising textual material and then recombining and manipulating the codes in new ways [28]. During the open coding process, the raw data from the open-ended questions were labelled to form concepts which reflect the multiple meanings of tea cultivation and the relationship with protected areas. Similar concepts were further combined to categories that scaled up scattered concepts to cover the major research questions that the research aim to answer, including basically economic meanings, social-cultural meanings, park-people synergies and conflicts, protected area management outcomes, etc., laying the foundation for axial coding and provide information for the Results section. The main purpose of axial coding is to discover and establish relationships between concepts to characterise the linkages between different categories [28]. With multiple concepts and categories, the relationship between multiple meanings of tea cultivation and the current park-people interactions was built from a perspective of ecosystem service trade-off. This basically provided information for the Discussion section.

Quantitative data from the survey were entered and analysed using Statistical Package for the Social Sciences (Version 21) and the significance value is 0.05 if not specifically mentioned. The data were analysed in terms of descriptive statistics for general data and perceptions of the management of tea and the protected areas. Non-parametric correlation and categorical regression were used to reveal the relationship among basic factors associated with land use and how they affect income.

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For the assessment of the importance of the ecosystem services, each respondent was provided with a list of 15 ecosystem services with illustrations to assist understanding [22]. They were asked to select and ranked five ecosystem services from the list. Ecosystem services with ranks from one to five were given a score from six to two, respectively, and those not selected were given a score of one. An average weighted score of each specific ecosystem service was calculated according to all the respondents using the equation: $\sum(S_i \times f_i)$, where Si was the given score of a specific ecosystem service by each respondent and fi was the frequency of respondents making this choice, i was six selecting results. i=1 to 5 when the ecosystem service was ranked from the first to the fifth, and i=6 when it was not selected.

A multiple correspondence analysis (MCA) was used to explore the synergy and trade-off of the social preference of ecosystem services among tea farmers. MCA is a descriptive method that reveals patterning in a complex dataset and is widely used in studies where a large amount of qualitative data is collected [29]. Each of the 15 ecosystem services was a variable with two categories of selecting this ecosystem service and not selecting it based on the ranking procedure, making it a total dimension of 15 (30 minus 15). The calculated total inertia was 1 (the maximum number of MCA dimensions (n=15) divided by the number of variables (n=15)). A solution was explored with two MCA dimensions: the first accounting for 12.3% (0.123/1) of the variance and the second for 11.2% (0.112/1), yielding a total variance of 23.4% (0.234/1). Discrimination measures and a joint plot of category points were obtained. In the plot, the coordinates of each category ((non-) selection of an ecosystem service) on each dimension were displayed to determine synergy and trade-off patterns of ecosystem services as perceived by tea farmers. The distance from an object to the origin is the reflection of the variation from the "average" pattern (the most frequent category for each variable). Thus, ecosystem services which were perceived almost unanimously as important or not lie near the origin, and vice versa.

2.3 Sample description

The average age of the 221 respondents was 49 years; 62% of them was between 40 to 59 who were a major labour force. Males and females represent 84% and 16% of the sample, respectively. 71% of the sample was the householder and the ratios of males and females were 97% and 3%, respectively (Table 1). Most of the respondents (47%) held a secondary school degree while 30% had finished primary education at best.

The average family size was five people. Most of the respondents (83%) had a family size of at least four people. The average ratio of the labour force in a family was 55%, and the ratio was more than 50% for 60% of the respondents. The median length of engaging with tea cultivation of the household was 20 years (n=218) with a range of one year to 60 years. The median length of local residency was 47 years (n=217) with a range of five to 75 years. Most respondents (52%) claimed annual household income as between 100 000 and 500 000 yuan (about 16 000 to 80 000 USD) (n=218).

For the ownership of tea orchards, the median number of land plots for a household was four plots, ranging from one plot to 60 plots (n=202). The median number of the total area of tea plots of each household was about 20 mu (1.33ha) ranging from one to 400 mu (0.067ha to 26.67ha) (n=216). The longest walking distance from home to attend to the tea bushes was 20 km and the median distance was 2.8 km. Most of the respondents (72%) had tea plots within a walking distance of 5 km.

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Table 1. Description of the tea farmers involved in the social survey.

Factor	Category	(%)	Factor	Category	(%)
Gender	F	16	Household	1-3	17
	M	84	size	4-6	65
Age	18-24	1		7-9	13
	25-39	17		>10	5
	40-59	62	Labour	<30	13
	>60	20	proportion	30-40	15
Householder	Yes (F, M)	71 (3, 97)	(%)	40-50	12
	No (F, M)	29 (49, 51)		>50	60
Education	Primary and under	30	Land Plots	1	10
	Junior	47		2-5	46
	Senior	17		5-10	36
	College and above	6		>10	8
Engaging with tea (years)	<5	10	Land area (mu)	<5	6
	6-10	12		5-10	11
	11-20	26		10-20	23
	21-30	31		20-40	38
	>30	21		40-60	6
Time of local residency (years)	<30	4		>60	17
	30-40	14	Walking distance (km)	<1	3
	40-50	37		1-5	69
	50-60	25		5-10	19
	>60	20		>10	9
			Annual	<5	9
			household	5-10	17
			income	10-50	52
			(10 000 RMB)	50-100	11
				>100	12

3. Results

3.1 The importance of tea cultivation as economic benefits

Tea was essential for livelihood. Considering the entire sample, households who had a longer residency time also had a longer engagement with tea cultivation ($p<0.01$). In addition, households that owned more plots tended to have a larger total area of land ($p<0.01$, $n=202$). Furthermore, households who had more plots and a larger area of tea orchard travelled longer to their land ($p<0.05$, $n=199$; $p<0.05$, $n=213$, respectively). Families with a larger scale and higher ratio of workforce tended to own a larger area of land ($p<0.05$, $n=217$; $p<0.05$, $n=217$, respectively).

For most respondents (97%), tea was mainly for sale on the market for income. 46.6% of the respondents reported that they focused on the national market and 33.5% local market. Tea farmers sold raw tea leaf, coarse tea or refined tea with a certain proportion according to market conditions and their capacity. According to the respondents, one unit of refined tea was produced from two units of coarse tea dried from 10 units of raw tea leaf in the Wuyishan area. The market value of coarse tea and processed tea varied a lot due partly to the geographic location of tea orchards. The unit yield of raw tea leaves ranged between 100 to 750 kg/mu. Raw tea leaf was priced between 6 and 20 yuan/kg (0.96 to 3.2 USD/kg) and refined tea between 60 and 600 yuan/kg (9.6 to 96 USD/kg).

As tea cultivation was claimed the most important income source (90% above), the categorical regression was used to reveal how the level of income depends on the multiple

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socio-economic factors specific to the tea farmers (Table 2). It was found that the annual household income level has been significantly affected by the total area of tea orchards, family size, the percentage of the workforce, the number of tea plots and the distance of the farthest land plot, all indicating a positive relation. Therefore, the income was basically affected by land and labour.

Table 2. Impact on the household income from the analysis of categorical regression

Dependent	Independent	Beta
Annual Household Income	Residency time	-0.076
	Time of engagement with tea	0.068
	Family size	0.157[b]
	The ratio of the workforce	0.159[b]
	Number of plots	0.19[b]
	Land area	0.553[b]
	Longest walking distance	0.129[a]
	Education	0.100

a $p \leq 0.05$; b $p \leq 0.01$; $R^2=0.611$, n=194.

Respondents' perceptions of tea cultivation have revealed more details of their income dynamics and critical impacting factors besides those social-economic features.

They perceived income change differently (Fig. 2a). 44% of the respondents perceived an increase in net income since their engagement with tea plantation, but 38% claimed a continuous market fluctuation. Some tea farmers who were engaged with tea cultivation for more than 30 years had identified several critical timing in the fluctuation of market value. They described a general increasing trend along the last three decades and ascribed it to the confirmation, registration and Issuance of certificates on the right to the contracted management of forested land; while a recent (ca. 2015) decreasing trend was attributed to the increasing cost of labour by tea farmers.

For the intensity of market competition, more than 60% of respondents felt increasing pressure, compared to 6% who thought the opposite (Fig. 2b). Interestingly, 32% of respondents reported no pressure as most of them said that "we had no feeling of competition at all because we only focused on what we can achieve." They claimed to have a stable or even fixed source of customers and their land, i.e., *shan chang* (literally "the mountain") in specific geographical locations secured the tea quality. For those who had an experience of intensified competition, they ascribed it to several causes, such as unfair competition with fake commodities, farmers shifting from rice to tea planting, forcing the price down by buyers, no brand or green certificate for small-scale farmers etc.

For the environmental conditions (Fig. 2c), 59% of the respondents did not think there was a significant change regarding tea cultivation, especially soil and weather conditions; but not many thought that the climate was getting any better (12%) either. Those who felt a change, especially a negative one, attributed it to climate change and human disturbance. They claimed to have experienced a higher frequency of heavy rain, drought and spring frost, earlier warming, and more snowing days, all leading to the decrease in tea leaf yield. However, they also expressed satisfaction with the improvement of soil and water conditions due to human intervention such as weed control, fertilisation, forestation and water conservation. Furthermore, respondents mentioned that important environmental conditions for tea cultivation, including rock, soil, topography and forest, cannot be separated but forming an integrated system, the *shan chang*, which was suitable for tea bushes to gain sunshine and water.

Ownership of *shan chang* was very stable as thought by 96% of the respondents. Some pointed out that there was no way to own new land through land clearance and the only way to expand tea cultivation was to rent others' land (which was not in the same production collective) or to get subcontracted land (which was in the same production collective).

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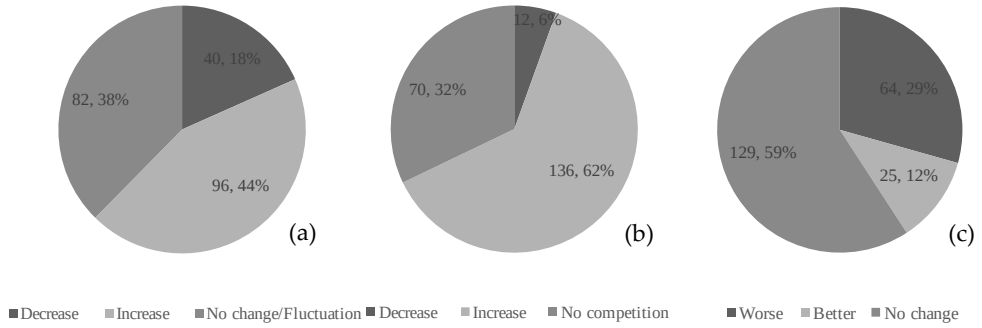

Figure 2. Tea farmers' perception of income (a), market competition (b) and environmental conditions (c) concerning tea cultivation and production. Illustrated by the number of respondents and the percentage.

3.2 The social-cultural benefit associated with tea cultivation

The assessment of the importance of typical ecosystem services in the Wuyishan area by tea farmers indicated meanings of tea cultivation beyond economic importance. For all the listed ecosystem services (Fig. 3), tea as a product was perceived by 95% of respondents as an important one that should rank the top five, followed by fresh water, which was chosen by 70% of the respondents. Few who did not rank tea cultivation to the top five important ones mostly perceive eco-tourism, air purification and local culture as more important. Eco-tourism was the most chosen cultural service as 60% of respondents thought it important, followed by local culture which was chosen by more than half of the respondents. For regulating services, the most chosen one was air purification (41%). The scores of each ecosystem service also indicated that tea farmers definitely thought the provisioning of tea was the most important ecosystem service to them (5.3), followed by fresh water (3.2), eco-tourism (2.5) and local culture (2.3).

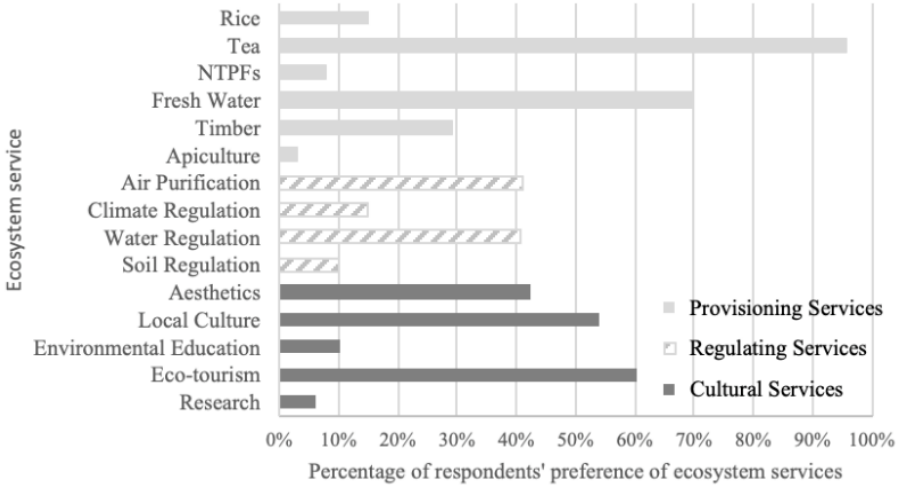

Figure 3. Tea farmers' preference of ecosystem services concerning their overall importance to life (NTFP: non-timber forest products)

The MCA revealed the relationship between different ecosystem services in terms of tea farmers' perception (Fig. 4). The first and second dimensions presented are, respectively, eigenvalue, 1.838 and 1.676; inertia, 0.123 and 0.112; and Cronbach's alpha, 0.658 and 0.638, which were slightly lower than the generally accepted lower limit of 0.70; however, a smaller value is acceptable in exploratory research [30]. The locations of choosing tea were very close to the origin of the coordinates, indicating that respondents had an almost unanimous assessment of the importance of tea cultivation. By contrast, locations

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of ES decisions far from the origin of the coordinates indicated not a unanimous perception of importance among respondents, such as the NTFPs, rice, research and environmental education.

The first axis revealed a trade-off between decisions of cultural services and other services except for tea cultivation or climate regulation, which indicates synergies between cultural services and the other two. The second axis revealed a trade-off between regulating services and other services except for fresh water, tea and aesthetics to show synergies. Therefore, respondents who perceived tea cultivation as important or not also tend to perceive cultural services and regulating services as important or not.

Figure 4. The MCA biplot of the preference of ES among tea farmers. Red: cultural services; yellow: provisioning services; green: regulating services

Following the preference of ecosystem services beyond tea as a product, respondents identified many socio-cultural meanings of tea in the answers to the open-end question of how tea farmers value their tea orchard under the construction of a national park. Three aspects were identified after coding all the expressions (Table 3). First, engaging with tea cultivation brought individuals with physical and mental health; second, it led to the social stability of the community; third, it facilitated the inherit of cultural heritage. These aspects were all confirmed as taking effects all the time, although some traditional knowledge was gradually lost. It was especially obvious that when asked about the concrete expressions or records regarding traditions associated with tea cultivation and processing, most respondents acknowledged that ceremonies were no longer practised and folk songs and sayings were not commonly mentioned in daily life.

Table 3. Socio-cultural benefit expressed by the respondents

Social-cultural meaning	Sample Expression
Physical and mental health	My view was broadened through communication during the tea sale.
	The natural environment secured high-quality tea which satisfied me.
	Regular working in the field has improved my physical condition.
	Drinking tea was good for people's health.
Social stability	Courtesy was practised during tea processing and ceremonies.
	Engaging with tea reduced time spent on gambling and drinking.
	Tea processing can absorb idle labour.
Cultural inheritance	The fame of Wuyishan was promoted.
	We can learn from historical experience.
	Tea culture can be promoted.
	New blending and flavor of tea can be invented.

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Nevertheless, they had still provided some information on the tea culture. Abundant folk songs and sayings were describing the origin of tea, the timing for attending to tea bushes, the experience of tea production, the technology of tea planting and processing and the value of tea. They agreed that inheritance and communication of relevant knowledge were still possible. When asked about tea cultivation and processing techniques, the 221 respondents provided 285 answers, of which 35% was "through communication with neighbours" and 29% was "passed on for generations", compared to 13% of "government technology popularisation" and 23% of "other sources". The respondents also mentioned the mix of practising religion with the production and enjoyment of tea. Finally, they confirmed that some traditions, such as the ritual of the initiation of tea picking, has been gradually resumed.

3.3 Perceptions of protected area management and expectation of future management

Respondents were aware of the existence of the protected areas and the impact of their management on tea cultivation. 83.3% of the respondents were aware of the existence of the national nature reserve and the scenic area, and the rest were not sure about the exact name (n=221). Concerning the awareness of the geographic location of their land (Fig. 5), only 15 respondents said they were not sure of the exact location, and other respondents all confirmed that they had tea plots inside of the protected areas (107, 48%) or not (99, 45%). For those who had land located inside of the protected areas, 61 (57%) perceived no effect of conservation management while 46 (43%) pointed out different forms of control that they thought of as disturbances to their tea cultivation. These claimed disturbances were listed in Table 4. Generally, there were two types of control; the first was a complete banning of certain land use or production way, the second was some specific development control. These identified as prohibition and restraints were all official policies other than collective actions as informal customs. A third disturbance was also mentioned as a side-effect or accidental injury to tea cultivation during the implementation of PA management policies, such as mistakenly removal of tea bushes, contamination of tea leaf by spraying insecticide to pine forest, lack of control on tourists who affect tea bushes.

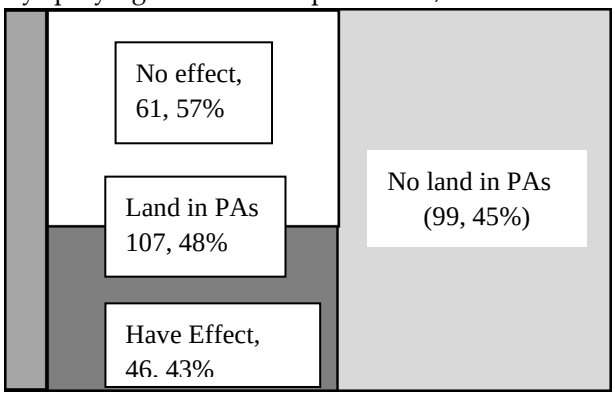

Figure 5. Perception of the impact of protected areas on tea orchard

Table 4. Identified disturbances to livelihood activities within the protected areas

Tea relevant	Prohibition	Restraints
No	Harvesting Chinese fir;	Tourism;
	Collecting firewood;	Collecting herbs;
Yes	Clearing forest;	Fertilizer amount;
	Pruning tree (to avoid shading tea bushes);	Tea bush trimming;
	Ketu (literally "guest soil"), replacing soils under	Flow of tea buyers;
	tea bushes with new soils from nearby;	Flow of motor vehicles;
	Modernising roads to tea terraces;	The scale of the tea processing factory;
		Choice of varieties of tea bushes;

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Respondents also hold diverse perceptions of protected area management concerning their ecological, economic and social outcomes. Ecological outcomes were explained as direct protection results concerning elements of the ecosystem and itself. Economic outcomes were income, job position, commercial opportunities etc., which can bring monetary benefit during PA management. Social outcomes were broader public welfare such as improvement in infrastructure and education with the existence of PA. In general, tea farmers were most happy with the ecological outcomes of conservation but the least with the realisation of public welfare. For ecological outcomes, 68% of the respondents provided a positive reply (Fig. 6a), while 45% of them claimed no enjoyment of any public welfare provided by the protected areas (Fig. 6c). Benefiting from commercial operation of the protected areas seems the most difficult to judge as numbers of respondents holding negative, positive and neutral attitudes were almost the same (Fig. 6b).

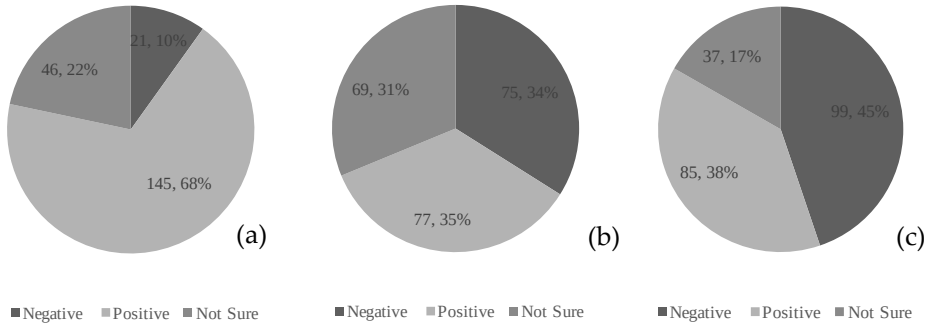

Figure 6. Tea Farmers' perception of conservation effectiveness: ecological outcomes (a), economic benefit (b) and public welfare (c).

Concerning the current establishment of the national park, respondents expressed their concern if tea plots would be returned to the forest. About 35% of the respondents held the attitude that there was no room for negotiation of any compensation fee as the tea orchard was the lifeline, and it was ridiculous to even think about land acquisition for other use. About 10% thought that giving up tea plantation was negotiable only if the compensation could satisfy them, the conditions including compensating according to the market value, the quality of land, and through land replacement, and the general expectation was that the living standard must not be lower than the current one. However, they acknowledged that negotiating conditions would be difficult based on their past experience. The rest all preferred monetary compensation alone. 16% of the respondents asked for annual compensation, and another 39% proposed one-off compensation. However, there was a wide range of expected payments judged by tea farmers. For the annual compensation, the expected value had a range between 10 500 and 15 000 000 yuan/ha (1 680 to 2 400 000 USD/ha); and for the one-off payment, that was between 3 000 and 9 000 000 yuan/ha (480 to 1 440 000 USD/ha).

4. Discussion

4.1 Sustaining traditions in a protected area under a modern market economy

This study revealed how the tea farmers perceived the role of tea cultivation as a major income source and as a potential way of providing multiple ecosystem services. One key finding is that although tea has become a commodity in the market, tea cultivation is still a traditional way of farming the forest in terms that it is highly dependent on the forest to nourish tea bushes by providing natural microclimate in the *shan chang*, and that it is land and labour intensive. In addition, tea farmers have their own way of minimising market risk by setting up a relatively fixed distribution channel in an acquaintance society. Therefore, with the natural environment guaranteeing the quality of tea leaves,

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the income from tea production was sustained through human activities in nature and the market. It seems that finding a balance between nature and the market is becoming difficult when farmers are facing the newly designated national park. On the one hand, farmers are eager to exploit forested areas beyond current *shan chang* when engaging deeper with the market competition; on the other hand, they are subject to even stricter land management rules as adjacent to protected areas. This dilemma is not uncommon globally [31-32], and significantly prominent in developing countries, where the rural landscape under conservation is usually subject to human disturbance, especially local communities' activities [33-35]. This study thus provides a way out of this dilemma to help conservation as well as rural development.

As in many agroforestry systems, tea cultivation in Wuyishan is not separated from the forest ecosystem, as it co-evolves with the latter to form a cultural landscape. Rural landscapes are understood as coupled social-ecological systems generating different ecosystem services that benefit human well-being and development [36]. Agriculture of multifunctionality was widely supported top-down as part of rural development policy in the European Union (EU) but farmers' perception and attitude were seldom studied within the context of nature conservation in developing countries [37-39]. In this study, when broadening the view from treating tea cultivation only as a provisioning service for income, we found another important point. Preference and assessment of the importance of ecosystem services showed that tea farmers think highly of local culture and eco-tourism, and tea cultivation is potentially clustered with cultural services. They all indicate that tea farmers may have the demand for commercialisation of the traditional culture embedded with tea for tourism purposes under national park management to fulfil other functions of tea cultivation beyond producing leaf. Nevertheless, appreciation of cultural services can still become a way of generating income besides tea production, and could possibly reduce the cases of illegal expansion of tea bushes to the forest because tea farmers themselves understood that culture may valorise the tea system. Concerning an even broader scope of social-cultural benefit, our study found that tea farmers cherish tea cultivation as a way of improving the well-being of a person, facilitating social stability and sustaining a living culture. These functions from tea cultivation comply with the objective of a healthy park-people relationship and they were not unique to tea cultivation but many traditional practices in rural areas.

Therefore, farmers in rural areas can and will maintain traditional activities under PA management, if they understand the traditional culture and ecological protection concept can valorise many elements during goods production. This balance between farmers' interest and public welfare can be realised through the integration of multifunctionality and sustainability [40]: through the provision of multiple goods and services from the same social-ecological system, there is both an added-value over land expansion (ecological valorisation) and diversity services over single products (cultural valorisation) to resolve the dilemma of rural development and conservation.

4.2 Benefit-sharing in the protected area

Equity and sustainability are important goals in natural resource management [41-42]. They also matter to the stability of a social-ecological system because resource users could perceive the benefit-sharing mechanism and react accordingly [6]. It is not surprising that tea farmers thought protected areas have affected their benefit mainly because some traditions in tea cultivation were not respected, such as pruning and Ketu (Table 4). However, some of the disturbances are not true disturbances regarding "tradition", such as the prohibition of "modernising roads to tea terraces" and the restraint of "flow of motor vehicles". They are identified as "disturbances" usually because they affect income generation activities. Nevertheless, results from the perception of current conservation effectiveness show that protected areas did not quite benefit tea farmers either through bringing income or providing more public welfare, although at the same time the

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biophysical conditions were improving. This indicates that a trade-off between maintaining the ecological functions and securing livelihood still exists.

In the newly designated national park, this issue is amplified as more working land is now within the boundary of the national park, making equitable and sustainable sharing of benefit and facilitating the stability of the social-ecological system more urgent. To ensure the resilience of the system, there are three aspects of this social-ecological system worth further discussion based on the results. First, the stability of the land tenure system and the consistency of the implementation of land policy is important, as farmers can't afford to lose land or affiliated products. Additionally, sustaining traditions in a market-oriented economy can benefit from treating the land property right as a bundle of rights. This means to constrain tea farmers' use rights but respect the right to benefit, as is usually practised in conservation easements [43-45]. In this way, there can be fewer bans but reasonable constraints on the tea cultivation and tea bush expansion so the farmers' can feel safe of their ownership of land. Second, the long co-existence of forest and tea orchards has brought to tea farmers, the user system, an impression that a healthy environment is good for both people and tea bushes. Actually, the well-preserved natural conditions can add value to the tea to make it from a common product to a famous brand that can transfer the ecological value to economic value [46-47]. Third, the resource system is not solely tea bushes, but the integrated forest ecosystem, i.e., *shan chang*. This means unnecessary human disturbance to the forest from tea cultivation should be reduced and only in the most suitable area where the favourable natural conditions and traditional techniques can add value to the tea product.

Therefore, the case of tea cultivation indicates that constraints to land use do not necessarily lead to instability of the system if users themselves can conduct conservation-compatible activities during production with potentially lost economic value remedied by transferred ecological value. Here we could define an activity spectrum according to conservation compatibility. Judged by conservation compatibility, conservation activities are those that have the least disturbance to the natural environment and non-conservation activities are those that go completely against conservation. Constraints to land can form a go and a no-go list, and land management is implemented accordingly [14]. This idea is not new and has been practised in some areas, such as restrictions on the owner's use of land in a conservation easement [48-50]. The difficulty is that this way of benefiting from conservation can be equitable and sustainable sometimes only in a long run, so some initiating stimulus and patient negotiation are necessary [51-53].

4.3 Making community livelihood compatible with conservation goals under a national park concept

The national park idea promoted in the Chinese context strengthens strict protection of large scale ecosystems and their processes, while respecting human activities conducted in harmony with nature, especially those practised by local residents for hundreds of years. It was originated through reflection on the efficiency of fortress conservation and the need to secure multiple ecosystem services [54]. Under this idea, conservation can provide opportunities for benefit sharing through sustaining traditions if added-values are realised through conserved nature instead of exploitation of forest and/or adding chemicals for quantity [55].

From tea farmers' perception of the role of tea and the relation between tea cultivation and protected areas, we feel that management should be implemented to three scales to help sustain tea cultivation under conservation goals (Fig. 7). This management may apply to other agroforestry systems in mountainous areas as well. It is highlighted that an efficient solution to a healthy park-people relationship based on a fair distribution of ecosystem services should not be looked at the park scale alone, but instead, on plot, mountain, and landscape scales. Because this enables divergent strategies at different scales and provides potentially more scalarly specific and also flexible options to integrate parks and people in fair ways.

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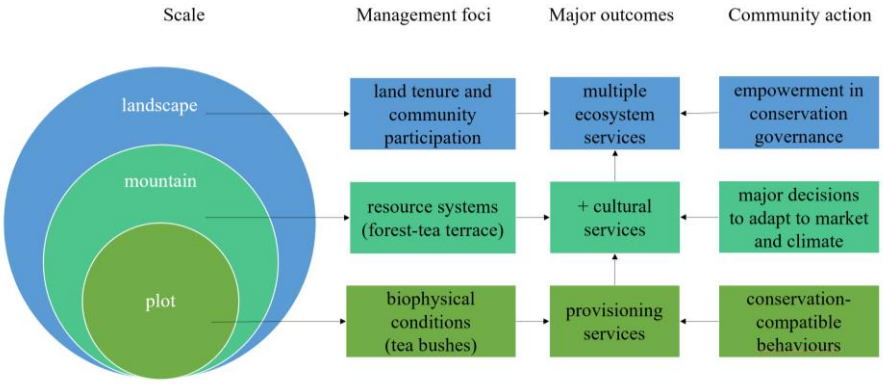

Figure 7. A scaling management strategy for adapting agroforestry systems to conservation in mountainous areas

First, at the scale of the plot, attention should be given to species and biophysical elements for tea bushes, such as tea breeding, soil and water conservation along the mountain slope. This is because these basic inputs sustain the growth of tea bushes and ensure the basic provisioning service. Conservation-compatible behaviours also start at this scale to avoid unfavourable activities such as killing trees.

Second, at the mountain scale, attention should be given to how the users manage the resource system. Major management decisions are made at this scale to link old wisdom with new technology to sustain the basic structure of the forest-tea terrace. Farmers are sensitive to land location and interactions with protected areas mainly at this scale, and they are seeking ways to adapt to climate change and fluctuating markets. They also tend to combine provisioning services with cultural services to enlarge income sources.

Third, at the landscape scale, attention should be given to the land tenure system and community's participation in conservation to varying degrees, such as conservation easement, payment for ecosystem services, conservation steward program etc. Homogenisation of landscape resulting from the expansion of tea cultivation will be disastrous to the forest and is a violation of conservation goals.

5. Conclusions

National parks in China will be very different from those in North America because it is difficult to find a large area of the wilderness without human activities perhaps except on the inner Tibetan Plateau. Finding ways out of the common dilemma of improving livelihood under conservation restrictions leads us to conduct this research when the newly proposed national park system provides opportunities to reflect on protected area management and learn from global experience. Wuyishan is a typical area where human activities have lasted very long with the remnant of the forest of high ecological values. This research found that conservation through setting up protected areas has impacted local tea farmers' understanding of conservation regarding their demand for income. It also found that maintaining tea cultivation in harmony with forest needs to find ways to add value to tea so as to incent tea farmers to comply with conservation rules to secure the stability of the social-ecological system.

The good thing is that as tea farmers are seeking an equitable and sustainable benefit sharing in the protected areas, the designation of a national park has the potential to secure the livelihood of tea cultivation and to promote cultural values which the tea farmers think highly of. Therefore, it is possible to maintain the stability of the social-ecological system at three spatial levels bearing the idea of a conservation compatibility spectrum: at the plot level where controlling and monitoring of biophysical elements are critical; the mountain level where production and market are critical and the landscape level where land tenure and community participation are critical.

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The findings are encouraging for many cultural landscapes around the world which face a similar challenge in nature conservation activities. Understanding the potential of multiple ecosystem service provision through farmers' perception will be helpful in PA designation and other ecological policy design and implementation. This three-level management may also help guide compatible production behaviours for conservation targets while securing farmers' income in populated PAs. Further research is also needed to find critical factors that could turn the potential of provision of multiple ecosystem services to real provision and income to create real multifunctional agriculture embedded and connected to protected areas.

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References

1. Dewu S.; Røskaft, E. Community attitudes towards protected areas: insights from Ghana. *Oryx*, **2018**, 52(3):489-496. DOI:10.1017/S0030605316001101.
2. Abukari, H; Mwalyosi, R. B. Comparing conservation attitudes of park-adjacent communities: the case of mole national park in Ghana and Tarangire national park in Tanzania. *Tropical Conservation Science*, **2018**, 11: 1940082918802757. https://doi.org/10.1177/1940082918802757.
3. Sirivongs, K.; Tsuchiya, T. Relationship between local residents' perceptions, attitudes and participation towards national protected areas: a case study of Phou Khao Khouay National Protected Area, central Lao PDR. *Forest Policy & Economics*, **2019**, *21*:92-100. https://doi.org/10.1016/j.forpol.2012.04.003.
4. Wang, Q.; Yamamoto, H. Local Residents' Perception, Attitude and Participation Regarding Nature Reserves of China: Case Study of Beijing Area. *Journal of Forest Planning*, **2009**, *14(2)*: 67-77. DOI: 10.20659/jfp.14.2_67.
5. Fischer, A.; Eastwood, A. Coproduction of ecosystem services as human–nature interactions—An analytical framework. *Land Use Policy*, **2016**, *52*: 41-50. DOI: 10.1016/j.landusepol.2015.12.004.
6. van Wyk E.; Breen, C; Freimund, W. Meanings and robustness: Propositions for enhancing benefit sharing in social-ecological systems. *International Journal of the Commons*. 2014, *8(2)*: 576–594. DOI: 10.18352/ijc.445
7. Young O R, Berkhout F, Gallopin G C et al. The globalization of socio-ecological systems: An agenda for scientific research. Global Environmental Change, **2006**, 16(3): 304-316. DOI: 10.1016/j.gloenvcha.2006.03.004.
8. Allendorf, T. D.; Aung, M.; Songer, M. Using residents' perceptions to improve park–people relationships in Chatthin Wildlife Sanctuary, Myanmar. *Journal of Environmental Management*, **2012**, *99*: 36-43. https://doi.org/10.1016/j.jenvman.2012.01.004.
9. Tessema, M. E.; Lilieholm, R. J.; Ashenafi, Z. T. et al. Community attitudes toward wildlife and protected areas in Ethiopia. *Society and Natural Resources*, **2010**, *23*: 489-506.
10. Bernués, A; Alfnes, F; Clemetsen, M. et al. Exploring social preferences for ecosystem services of multifunctional agriculture across policy scenarios. *Ecosystem Services*, **2019**, **39**: 101002. https://doi.org/10.1016/j.ecoser.2019.101002.
11. Huang, J.; Tichit, M.; Poulot, M. et al. Comparative review of multifunctionality and ecosystem services in sustainable agriculture. *Journal of Environmental Management*, **2015**, *149*: 138-147. https://doi.org/10.1016/j.jenvman.2014.10.020.
12. Marzban, S.; Allahyari, M. S.; Damalas, C. A. Exploring farmers' orientation towards multifunctional agriculture: Insights from northern Iran. *Land Use Policy*, **2016**, *59*: 121-129.
13. Ricart, S.; Kirk, N.; Ribas, A. Ecosystem services and multifunctional agriculture: Unravelling informal stakeholders' perceptions and water governance in three European irrigation systems. *Environmental Policy and Governance*, **2019**, *29(1)*: 23-34.
14. He, S.; Gallagher, L.; Su, Y. et al. Taking an ecosystem services approach for a new national park system in China. *Resources, Conservation and Recycling*, **2018**, *137*, 136-144. DOI: 10.1016/j.resconrec.2018.04.030.
15. Allendorf, T. D. Residents' attitudes toward three protected areas in southwestern Nepal. *Biodiversity and Conservation*, **2007**, *16(7)*: 2087. https://doi.org/10.1007/s10531-006-9092-z.
16. Ite, U. E. Community perceptions of the Cross River national park, Nigeria. *Environmental Conservation*, **1996**, *23(4)*: 351-357. http://doi.org/10.1017/S0376892900039217.
17. Hough, J. L. Obstacles to effective management of conflicts between national parks and surrounding human communities in developing countries. *Environmental Conservation*, **1988**, *15(2)*: 129–136. https://doi.org/10.1017/S0376892900028939.
18. Chen, X.; Lupi, F.; Liu, J. Accounting for ecosystem services in compensating for the costs of effective conservation in protected areas. *Biological Conservation*, **2017**, *215*: 233-240. DOI: 10.1016/j.biocon.2017.09.013.
19. Zhang, L.; Luo, Z.; David, M. et al. Biodiversity conservation status in China's growing protected areas. *Biological Conservation*, **2017**, *210*:89-100. DOI: 10.1016/j.biocon.2016.05.005.
20. Holling, C. S. Resilience and stability of ecological systems. *Annual Review of Ecology, Evolution, and Systematics*, **1973**, *4*:1-23. DOI: 10.1146/annurev.es.04.110173.000245.
21. Carpenter, S.; Walker, B.; Anderies, J. M. et al. From metaphor to measurement: resilience of what to what? *Ecosystems*, **2001**, *4(8)*: 765-781. https://doi.org/10.1007/s10021-001-0045-9.
22. He, S.; Gallagher, L.; Su, Y. et al. Identification and assessment of ecosystem services for protected area planning: A case in rural communities of Wuyishan national park. *Ecosystem Services*, **2018**, *31*: 169-180. https://doi.org/10.1016/j.ecoser.2018.04.001.
23. Zou, X. Wuyi Zheng Shan Xiao Zhong Hong Cha (The Wuyi Lapsang souchong). Zhong Guo Nong Ye Chu Ban She, Beijing, **2006**. (in Chinese)
24. Zhang, X.; Liu, X.; Zhang, B. et al. Will the Establishment of Nature Reserves Inevitably Lead to Low Household Income——An Empirical Study on Household Income within and nearby the Fujian Wuyishan National Nature Reserve. *Scientia Silvae Sinicae*, **2020**, *56(6)*: 165-178. (in Chinese)
25. Nastran, M. Why does nobody ask us? Impacts on local perception of a protected area in designation, Slovenia. *Land Use Policy*, **2015**, *46*: 38-49. https://doi.org/10.1016/j.landusepol.2015.02.001.
26. Bunker, N. An Empire on the Edge: How Britain Came to Fight America. Knopf, **2014**.
27. Cai, J. Collective Forest Tenure Reform Under The Perspective Of Sustainable Social-Ecological Systems: The Empirical Study Of Fujian Province. Zhong Guo She Hui Ke Xue Chu Ban She, Beijing, **2012** (in Chinese).
28. Holton, J. A. The coding process and its challenges. The Sage handbook of grounded theory 3, **2007**; pp: 265-289.
29. Greenacre, M.; Blasius, J. Multiple correspondence analysis and related methods. Chapman & Hall/CRC, **2006**, London, England.

30. Johnson, R. A.; Wichern, D. W. Applied Multivariate Correspondence Analysis, Prentice-Hall, Upper Saddle River, NJ, USA, 6th edition, **2007**.
31. Belsky, J. M. Community forestry engagement with market forces: A comparative perspective from Bhutan and Montana. *Forest Policy and Economics*, *2015*, *58(29-36)*, DOI: 10.1016/j.forpol.2014.11.004.
32. Brown, S.; Shrestha, B. Market-driven land-use dynamics in the middle mountains of Nepal. *Journal of Environmental Management*, **2000**, *59(3)*: 217-225. DOI: 10.1006/jema.2000.0355.
33. Li, Z.; Kang, A.; Gu, J. et al. Effects of human disturbance on vegetation, prey and Amur tigers in Hunchun Nature Reserve, China. *Ecological Modelling*, **2017**, *353*: 28-36. DOI: 10.1016/j.ecolmodel.2016.08.014.
34. Yu, P.; Liu, H.; Chen, S. Influences of human disturbances on vegetation of Songshan National Level Nature Reserve. *Scientia Silvae Sinicae*, **2002**, *38(4)*:162-166. (in Chinese)
35. Zeng, H.; Sui, D. Z.; Wu, X. B. Human disturbances on landscapes in protected areas: a case study of the Wolong Nature Reserve. *Ecological Research*, **2005**, *20(4)*: 487-496. DOI: 10.1007/s11284-005-0065-6.
36. Parrott, L.; Meyer, W. S. Future landscapes: managing within complexity. *Frontiers in Ecology and the Environment*, **2012**, *10(7)*: 382-389. https://doi.org/10.1890/110082.
37. Brunstad, R. J.; Gaasland, I.; Vårdal, E. Multifunctionality of agriculture: an inquiry into the complementarity between landscape preservation and food security. *European Review of Agricultural Economics*, **2005**, *32(4)*: 469-488. https://doi.org/10.1093/erae/jbi028.
38. Kohler, F.; Thierry, C.; Marchand, G. Multifunctional agriculture and farmers' attitudes: two case studies in rural France. *Human Ecology*, **2014**, *42(6)*:929-949. https://doi.org/10.1007/s10745-014-9702-4.
39. Song, B.; Robinson, G. M. Multifunctional agriculture: Policies and implementation in China. *Geography Compass*, **2020**: p.e12538. https://doi.org/10.1111/gec3.12538.
40. Hediger, W.; Knickel, K. Multifunctionality and sustainability of agriculture and rural areas: A welfare economics perspective. *Journal of Environmental Policy & Planning*, **2009**, *11(4)*: 291-313. https://doi.org/10.1080/15239080903412453.
41. Brock, W. A.; Carpenter, S. R. Panaceas and Diversification of Environmental Policy. *PNAS*, **2007**, *104(39)*:15206–15211. DOI: 10.1073/pnas.0702096104.
42. Smith, P. D.; McDonough, M. H. Beyond Public Participation: Fairness in Natural Resource Decision Making. *Society and Natural Resources*, **2001**, *14(3)*:239–249. https://doi.org/10.1080/08941920120140.
43. Güneş, Y. Conservation Easement and Common Law Easement as a Nature Conservation Tool within the Context of Property Rights and the Economic Trade Off. *Annales de la Faculté de Droit d'Istanbul*. **2007**, *39(56)*: 279.
44. Rissman, A. R. Rethinking property rights: comparative analysis of conservation easements for wildlife conservation. *Environmental Conservation*, **2013**, *40(3)*: 222-230. https://doi.org/10.1017/S0376892913000015.
45. Watson, R.; Fitzgerald, K. H.; Gitahi, N. Expanding options for habitat conservation outside protected areas in Kenya: The use of environmental easements. African Wildlife Foundation Technical Papers, **2010**, 2.
46. Egelyng, H. Informed Markets as Policy Instrument for Environmental Governance of Buffer Zones around Protected Areas: a global context and European cases. Paper presented at ECPR Joint Sessions, **2014**, Salamanca, Spain.
47. Owusu, A. Alleviating Rural Poverty in Ghana through Marketing Of Tourism Sites And Protected Areas. *European Journal of Business and Management*, **2013**, *5(1)*: 238-245.
48. Brain, R. G.; Hostetler, M. E.; Irani, T. A. Why do cattle ranchers participate in conservation easement agreements? Key motivators in decision making. *Agroecology and Sustainable Food Systems*, **2014**, *38(3)*: 299-316. https://doi.org/10.1080/21683565.2013.819479.
49. Davis, A.; Goldman, M. J. Beyond payments for ecosystem services: considerations of trust, livelihoods and tenure security in community-based conservation projects. *Oryx*, **2017**: 1-6. DOI: 10.1017/S0030605317000898.
50. Stroman, D.; Kreuter, U. P. Factors influencing land management practices on conservation easement protected landscapes. *Society & Natural Resources*, **2015**, *28(8)*: 891-907. DOI: 10.1080/08941920.2015.1024365.
51. Berkes, F. Community-based conservation in a globalized world. *PNAS*, **2007**, *104(39)*: 15188-15193. DOI: 10.1073/pnas.0702098104.
52. Ingram, J. C.; Wilkie, D.; Clements, T. et al. Evidence of Payments for Ecosystem Services as a mechanism for supporting biodiversity conservation and rural livelihoods. *Ecosystem Services*, **2014**, *7(C)*:10-21. DOI: 10.1016/j.ecoser.2013.12.003.
53. Jamal, T, Stronza A. Collaboration theory and tourism practice in protected areas: Stakeholders, structuring and sustainability. *Journal of Sustainable tourism*, **2009**, *17(2)*: 169-189. https://doi.org/10.1080/09669580802495741.
54. Xu, W.; Xiao, Y.; Zhang, J. et al. Strengthening protected areas for biodiversity and ecosystem services in China. *PNAS* **2017**, *114(7)*: 1601-1606. https://doi.org/10.1073/pnas.1620503114.
55. He, S.; Gallagher, L.; Min, Q. Examining Linkages among Livelihood Strategies, Ecosystem Services, and Social Well-Being to Improve National Park Management. *Land* **2021**, 10, 823. https://doi.org/10.3390/land10080823.