Explaining success on community forestry through a lens of environmental justice: Local justice norms and practices in China

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Abstract
It is of global interest to understand under what conditions community forestry can be successful and sustainable in terms of environmental conservation and local livelihood benefits. Existing theories have explained several influential factors, including small groups of people with shared norms, sound institutions, high levels of decentralization, downward accountability, and security of tenure. This paper explores how local conceptions of environmental justice become closely linked to sustainable community forestry. Based on an in-depth case study in a highly populated and culturally heterogeneous village in southwest China, we examine an enduring example of community forestry, using a combination of qualitative and quantitative approaches. The results show that village forest cover has increased significantly over the last 30 years, contributing to improvements in local livelihoods. It is argued that one of the important factors in this success has been villagers' ability to align forest management with local justice norms and practices. Distributive, procedural, and recognition aspects of justice are considered, and we find that, in combination, these become integral to building effective institutions for collective action. To broaden the focus on successful factors in existing theories, this paper argues that the consideration of justice as an important condition for establishing effective and durable local institutions that will be effective for community forestry. The insights from this study suggest a need to consider justice dimensions in community forestry research to enable improved understanding of its dynamics and outcomes worldwide.

Keywords: collective action; decentralization; design principles; environmental justice; common-pool resources; local institutions

1. Introduction

Community forestry[1] is considered to have great potential for conserving global forests and simultaneously improving local livelihoods, and has been promoted by intergovernmental agencies, non-governmental organizations, and forestry practitioners since the late 1980s (Pagdee et al., 2006; Porter-Bolland et al., 2012; Lund et al., 2018; Arts and De Koning, 2017; Hajjar & Oldekop, 2018). It has been estimated that community-managed forests are storing about 300 billion metric tons of carbon, which is equivalent to 33 times the 2017 global energy carbon emissions, thereby making a significant contribution to combating climate change (Rights and Resources Initiative, 2018). Also, community forestry positively contributes to achieving many of the United Nations' Sustainable Development Goals (SDGs) (De Jong et al., 2018)[2]. As such, there has been a global campaign to devolve the management of forests to communities for promoting the development of community forestry worldwide (Agrawal et al., 2008; Yin et al., 2016; Hajjar & Oldekop, 2018).

Community forestry is practiced differently across various countries. These practices have been variously labeled, including: joint forest management in India (e.g., Sundar, 2017; Mukherjee et al., 2017), collective forest management in China (e.g., Liu & Ravenscroft, 2016; He et al., 2020), user group initiatives in Nepal (e.g., Paudel, 2016; Ojha, 2014), forest decentralization in Latin American countries (e.g., Andersson, 2013; Cronkleton & Larson, 2015), and participatory forest management in African countries (e.g., Khatun et al., 2015, Kahsay & Bulte, 2019). While different in name, the common characteristic is that local communities participate in decision-making and they are actively involved in and benefitting from the forest management.

Along with the diversity of practices, the success of community forestry is not universal[3]. Such projects can fail for various reasons, including elite capture, over-commercialization, tenure insecurity, state interventions, and overruling (Baggio et al., 2016; BenYishay et al., 2017; Buntaine et al., 2015; Rasolofoson et al., 2015). Scholars are therefore interested in examining factors that facilitate successful community forestry. Apart from global meta-analyses (e.g., Pagdee et al., 2006; Baynes et al., 2015), a number of empirical case studies revealed a wide range of factors that could affect the success of community forestry. As forests managed by local communities are regarded as common-pool resources[4], literature has been largely influenced by Ostrom's "Eight Design Principles"[5] based on the theory of institutional economics, whereas scholars attempt to explore factors that influence the building of institutions[6] for achieving collective action in community forestry. Leaving the biophysical condition aside, Table 1 summarizes the key socioeconomic factors[7] affecting the success of community forestry, based on the key literature.

Key success factors	Key references

Community characteristics	
1) Small group size 2) Shared norms 3) Homogeneity in identity and interests 4) Traditional practice	Ostrom, 1990; Baland & Platteau, 1996; Poteete & Ostrom, 2004; Yang et al., 2013; Casari & Tagliapietra, 2018
Institutional arrangements	
1) Simple and easy-to-understand rules 2) Effective enforcement 3) Sanctions/penalties 4) Downward accountability	Ostrom, 1990; Baland & Platteau, 1996; Ribot et al., 2006; Agrawal & Chhatre, 2006; Ostrom, 2007; Andersson et al., 2014
Level of decentralization	
1) Relocation of administration 2) Budget relocation 3) Degree of local control 4) Recognize local groups 5) Meaningful power transfer	Colfer & Capistrano, 2005, Ribot et al., 2006; Ribot et al., 2010; Andersson et al., 2006; Agrawal et al., 2008; Andersson, 2013; Wright et al., 2016; Lund & Saito-Jensen, 2013
Property rights regimes	
1) Clearly defined boundaries 2) Security of tenure over forest 3) Clear ownership	Ostrom, 1990; Agrawal & Ostrom, 2001; Larson et al., 2010; Balooni & Lund, 2014; Robinson et al., 2014; Yin et al., 2016

Table 1. Key socioeconomic factors affecting the success of community forestry

In this paper, we contribute to the knowledge about the success of community forestry by exploring in detail the role of local norms[8] through the lens of environmental justice[9]. We highlight the significance of local norms and, in particular, the importance of being able to align these norms with forest benefit-sharing and decision-making. We employ an illustrative case study from China, where it is particularly challenging to apply some of the design principles in Table 1. In this study, we encountered community forestry cases that succeed in social and ecological outcomes, but do so without adhering to many of the design principles, including small group size, homogeneity in identity and interests, downward accountability, high level of decentralization, and security of tenure[10]. We explain this apparent contradiction with prevailing knowledge by referring to recent research that employs environmental justice as a novel analytical framework[11]. Whilst justice has typically been considered an outcome variable, an emerging body of work also considers (perceptions of) justice and equity as instrumental to sustainability (e.g., Schreckenberg et al., 2016; Dawson et al., 2018). This is because attempts to accelerate transitions to sustainability governance often fail as they run up against contested notions of fairness (Sikor, 2013; Pascual et al., 2014; Martin, 2017). In this light, we explore the way in which local norms are aligned with forestry practices, including those rules and practices relating to the distribution of benefits and decision-making procedures.

We see the potential for alignment as strongly determined by the degree of local control over rule-making, which in turn is associated with state recognition of local forestry knowledge and practices. In this way, we find that an environmental justice analysis helps us to rethink some key connections across criteria related to norms, rules, control, and recognition in explaining the success of community forestry (Table 1). As such, we argue that the consideration of justice as an important condition for establishing effective and durable local institutions that will be effective for community forestry.

The paper is organized into six sections. In the next section, we provide the analytical framework derived from theories of environmental justice, followed by details of the research methods and research site. The fourth section presents the outcome of community forestry, including an overview of community forestry and the positive ecological and economic outcomes at the study site. The fifth section discusses reasons for the positive outcomes by examining local justice norms and practices in benefit distribution, participation, and recognition. The paper concludes by discussing the theoretical and empirical implications of the research.

2. Lens of environmental justice for analysis

The empirical approach for environmental justice taken in this research is informed by Martinez-Alier (2003), Schlosberg (2004), Walker (2012), and Sikor et al. (2014), who show the multi-dimensions for justice in environmental practice and policies. The empirical approach also intended to explore the norms of justice asserted by people and how some norms gain support and come to be considered the legitimated practice on the ground in a highly context-in-dependent manner (Fisher et al., 2018). As such, a local norm is *practical* and *informal* and it is locally contextualized and legitimated as actual patterns of governance and actual behavior (Olivier de Sardan, 2013). Accordingly, this paper considers community forestry practices for collective action guided by local justice norms which have received legitimacy[12] and support from the perceptions of justice that people hold.

For the empirical research, we applied the conceptual framework developed by Sikor et al. (2014) to examine how the criteria were selected for given subjects in framing peoples' notions of justice (see Figure 1). The criteria in the framework are commonly considered as decision-making guidelines for framing a justice notion on a given subject, which, for example, could include equality, need, merit, and deservedness. In community forestry, for example, it can include the idea of distribution of benefits from the forest among people based on principles such as equalitarian, inputs, opportunity costs, and needs. The subjects can be regarded as different stakeholders considered to possess rights or bear responsibilities. In common-pool resource, for example, it includes local poor people, the entire local population, different generations, or nature[13]. By incorporating the work of Schlosberg (2004), this framework also suggests that people's justice notions can

be examined from three dimensions, namely distribution, participation, and recognition, which formed the central dimensions of our analysis.

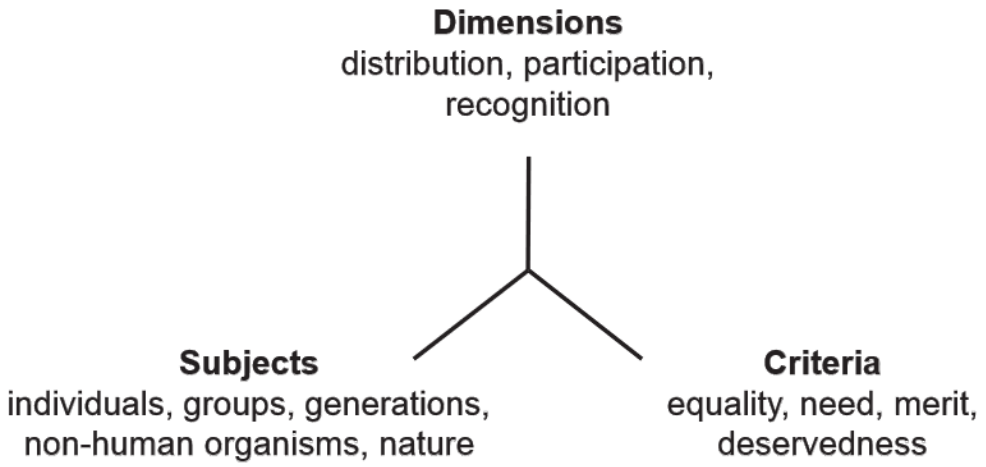


Figure 1. Conceptual framework for justice analysis

Source: Sikor et al., 2014.

Here, the distribution dimension, or what is well-known as distributive justice, is about the distribution of benefits and burdens between people (Sikor et al., 2014). This could relate to, for instance, access to clean water or exposure to air pollution. It reflects the ability of different actors to distribute those environmental benefits and costs. Second, the participation dimension, also known as procedural justice, is about decision-making mechanisms. It refers to fairness in political processes that allocate resources and resolve disputes, where participation in decision-making is the key element, which includes the norms of representation and inclusion (McDermott et al., 2013). The third dimension of environmental justice is recognition, which was regarded as an inherent precondition for distributive justice and an ideal type of participation (Schlosberg, 2004). Recognition requires the consideration of people's distinct identities and histories and avoids cultural domination of some groups over others by respecting social and cultural differences. It also calls for the recognition of the diversity of experiences and knowledge of groups and resists any pressure on minority groups to assimilate to dominant norms (Martin et al., 2016).

Further, the three dimensions of justice concerns are interlinked, overlapping, and connected. Participation in public decision-making can lead to the equitable distribution of outcomes. Recognition of social differences can facilitate the inclusion of particular people in decision-making. Redistributive actions can empower previously marginalized people to participate in public decision-making or gain recognition. However, it can also be context-dependent,

for in some cases these dimensions may not be mutually supportive (Martin et al., 2014). Thus, empirically, how people frame their notion of justice for each dimension might be locally embedded with their history, geographical condition, and socioeconomic context.

There is also scale issue in justice notion. For example, distributional fairness of benefits from same piece of forest might be considered in monetary principle at community level (Fisher et al., 2018), but could be priority of consideration at national and global level for watershed service (He and Sikor, 2015), biodiversity (Martin et al. 2013) or carbon sequestration (Sikor and Cam, 2016). The higher level of justice consideration can affect local justice norm and practice. For example, national recognition of local right and culture would enable better local distribution of benefit and participation (He, 2020a). Thus, interplays between place-specific and large-scale justice notion broaden the analytical framework for global environmental justice consideration (Martin, 2013, Sikor and Newell, 2014).

Furthermore, there is a close link between community forestry and justice dimensions, particularly for the distributive and procedural dimensions. The literature has documented the positive livelihood outcomes of community forestry well (Bowler et al., 2012; Hajjar et al., 2016). These analyses not only focus on enabling local access to forest benefits, but also examine the fairness of benefit-sharing among stakeholders in different types of community forestry (e.g., McDermott et al., 2009; Oldekop et al., 2010). On the other hand, as a form of decentralization, community forestry has attracted great attention to its institutional arrangements (e.g., Agrawal et al., 2008; Hajjar et al., 2016). Those studies have documented the importance of local participation in decision-making. Existing studies also highlight the importance of recognizing local rights (e.g., Balooni & Lund, 2014; Arts & De Koning, 2017; Blackman et al., 2017). While there is a rich and growing literature on community forestry, the consideration of justice analysis in community forestry is largely absent. The explicit linkage between justice and community forestry is therefore under-documented.

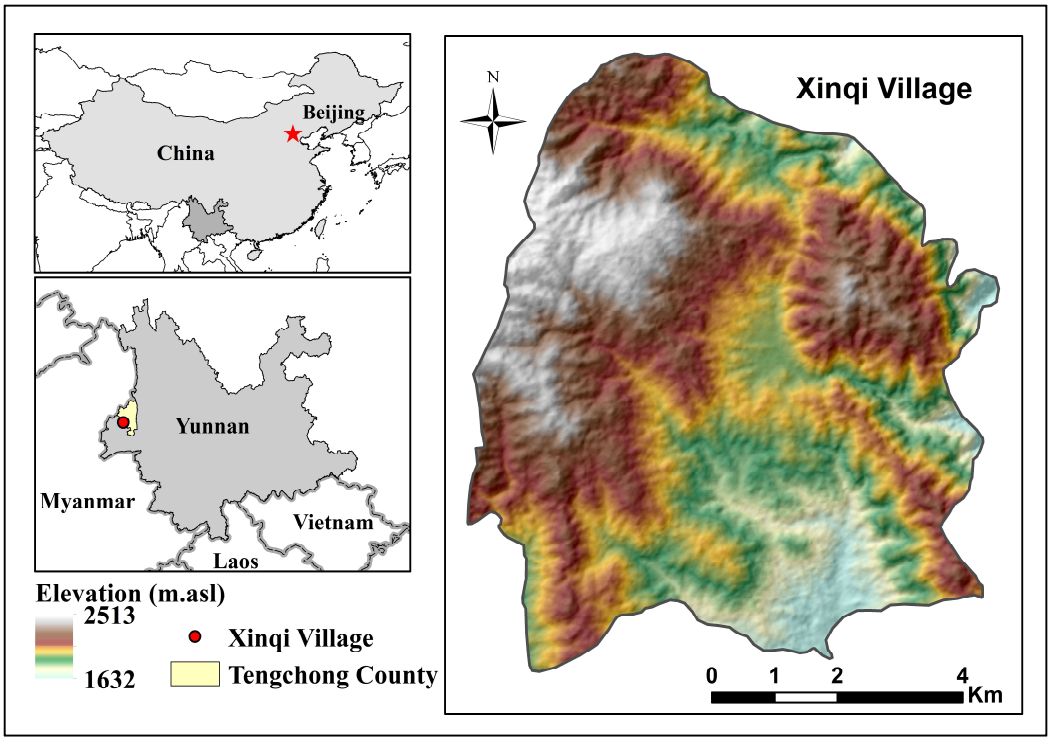
Unlike existing literature, this research applied an environmental justice framework to examine the success of community forestry via an in-depth case study. As for locally self-initiated and self-governed community forestry in China, we explored how distribution was done, how participation was understood and implemented, and analyzed recognition as a pre-existing mechanism. Based on the examination of different dimensions of justice in community forestry management, we explained the crucial role of justice in the success of community forestry.

3. Research site and methods

3.1 Study area

This case study was carried out in Yunnan Province, southwest China (see Figure 2). Yunnan Province is at the head of six national and international river basins, is a global biodiversity hotspot (Myers et al., 2000), and is rich in ethnic and cultural diversity (Loh & Harmon, 2005). Communities have long practiced their traditional upland agriculture but are currently facing great change associated with rapid development and socioeconomic transition (Zinda & He, 2020, He, 2020b). Yunnan's wealth of valuable forests and well-preserved ecosystems has drawn national attention for conservation investment, while poverty continues to be an issue that the government is attempting to address. If the traditional ecosystem management practices can continue, they can play an important role in conservation and development in Yunnan, as the province faces rapid modernization and globalization.

Figure 2. Location of the study area [please use color for all figures from here onwards]



Source: EARTHDATA[14]

The study was conducted in Xinqi Administrative Village[15], Tengchong County, in Baoshan Municipality (Figure 2). This Administrative Village includes five natural villages, with 1176 households and a total population of 4674 Han-Chinese (male=2469; female=2205; less than 18 years old=726; over 60 years old=640), whose average net income per capita was about 1862 USD in 2018. The total territory of Xinqi is 53.19 km^2. The people have been managing the area's forests for centuries and currently the forest cover is around 78% of the total area. The major forest type is plantation, dominated by species including fir (*Taiwania flousiana, Tsuga dumosa*), pine (*Pinus armandii, P. yunnanessi*), and alder (*Alnus nepalensis*). The people of Xinqi traditionally managed their agroecosystem with upland farming and agroforestry (i.e., annual

crops of corn and wheat intercropping with walnut, camellia, and other trees), but they are now also engaged in a large-scale state afforestation program (i.e., the Sloping Land Conversion Program)[16]. Well-preserved forest in Xinqi has generated significant revenues for both individual households and communities, which account for 30% of the income of individual households and 80% of the community collective fund. Given this successful forest management, Xinqi has become a provincial and national example of community forestry. Xinqi's biophysical and socioeconomic conditions serve well for a case study to apply the justice analysis to examine local norms and practices of justice through the distributive, procedural, and recognition dimensions. This is a good match with our study's aim of explaining the success of community forestry through the lens of environmental justice.

3.2 Data collection and analysis

This study adopted an in-depth case study approach to understanding the justice norms and practices as underlying reasons for local livelihood transitions and ecological change. Through a longitudinal study, a robust dataset was derived from four phases of extensive fieldwork: from May to December 2012, in December 2013, from July-September 2014, May-July 2015, and in July 2018. As an interdisciplinary study, data were collected and analyzed through a range of qualitative and quantitative approaches.

First, changes in land use were assessed using remote sensing images, topographic maps, and ground truthing points. The time series of land use and land cover data from 1989, 2002, and 2017 were derived from 30m resolution Landsat TM, ETM+, and OLI images, respectively. Data on land use in 2011 was obtained from a RapidEye image with a 5m resolution. This covered the time period of major state policy interventions, such as market liberalization in the 1980s, the Sloping Land Conversion Program (SLCP, 2002-2017), and the Collective Forest Tenure Reform (2004-2013). The comparison of land use and cover change across different time periods helped to show the success of community forestry in terms of it improving village forest cover.

Second, a questionnaire survey was carried out with 60 randomly selected households[17] in the Administrative Village. The questionnaire covered two key dimensions of environmental justice, namely distribution and participation, adopting the empirical approach developed by Martin et al. (2019)[18]. Recognition was excluded as it is difficult to capture through quantitative methods[19]. To capture the notion of distributive justice, the interviewees were asked to rank their preferences for revenue distribution methods from most to least including 1) prioritizing poverty alleviation (pro-poor), 2) distributing equally among individual farmers (equal distribution), 3) investing to generate public goods for the community (community), 4) distributing to those who experienced losses arising from forest management (compensation), and 5) prioritizing the flow of rewards to those who have contributed most to producing them (contributor). We used these preferences as criteria for examining the distributive justice. On the other hand, to understand the norms of

procedural justice, we asked the interviewees to rank their preferences for forest revenue distribution procedures, which included 1) village leader, 2) village assembly (community), 3) township official, and 4) private sector in the forest.

Third, qualitative data was collected relating to community forestry history, institutional arrangements, and local norms of justice. This data was obtained through: 1) in-depth interviews with key informants (N=32), including elders, village leaders, women, farmers, and local government officials who extensively engaged in and know a lot about community forestry; and 2) three focus group discussions in the village (one with elders, one with women, and one with men, with five to six villagers in each group discussion). Data on the community forestry was collected to obtain an in-depth understanding of local historical perceptions of land use change, institutional arrangements for forest management, and implementation processes of different forest policies. The qualitative approach was also used to understand the norms of justice, with a particular focus on the dimension of recognition using observations, interviews, and focus group discussions. As a longitudinal study, the long-term engagement at the study site by the first author also enabled rich insights into justice from a local perspective.

Data were analyzed quantitatively and qualitatively. For analysis of the spatial data, satellite images were classified using an object-based classifier-definiens, following Di Gregorio and Jansen's (2000) definition of natural vegetation and classification concepts and the classification process as detailed by He et al. (2014)[20]. ArcGIS software was used to compare the area of changes in each land use and land cover type based on the classification results. For analysis of the questionnaire survey data, a Chi-square test was performed by using SPSS software to examine the significant levels of difference among different preference choices for the method of forest revenue allocation and the procedure for revenue allocation. The qualitative data analysis used content and thematic analysis and subsequent across-case analysis to understand the history, institutional arrangements, and dynamics of the community as well as norms and practice of justice. The qualitative data were merged with the spatial data and questionnaire data to elucidate reasons for the results. This combination of quantitative and qualitative approaches generated a range of robust data analyses, helping to understand how the community forestry has succeeded and the role of justice in this success.

4. Xinqi community forestry: an overview

4.1 History of community forestry in Xinqi

Xinqi village has a rich history of community forestry. About one hundred years ago, the village was founded by three kin named Yan, Du, and Yan, who depended on the forest for their subsistence until the establishment of the People's Republic of China in 1949. At that time, the forest was collectively managed under those three kin. However, massive deforestation occurred during The Great Leap Forward in 1958 and the Cultural Revolution from 1966-1976, when

the commune system of collectivization was introduced to extract timber to support industrialization, like elsewhere in China (Shapiro, 2001). Deforestation resulted in severe landslides, causing villagers to invest in afforestation. In 1962, the village established the first village-based Collective Forest Farm (集体林场) for afforestation and forest management by planting about 167 ha of fir (*T. flousiana*). Another four Collective Forest Farms[21] were established in 1978, with 400 ha of another species of fir planted (*T. dumosa*). Finance for the planting was via a loan from the local bank. During the 80s-90s, the number of Collective Forest Farms grew to 17, with a total area of 1667 ha planted, using more diverse species.

During 1980s, also there are several changes to forest tenure policy have occurred across China. In response, Xinqi has adapted to those change by creating its own special arrangements. The forest was collectively owned in the collectivization period, and redistribution of forest land to individuals was initiated by the village in the 1980s. Formal forest redistribution started in 1982 with the Two Mountain System policy to differentiate private forest and contracted responsibility forest from the collective forest. However, as the overharvesting of timber after the forest redistribution caused serious deforestation and conflict, in 1985 the villagers reached a common agreement to return the individual contracted responsibility forest to collective ownership and management. Since the logging quota system was also applied during this time, this village's self-initiated re-collectivization has significantly contributed to forest regeneration and conservation.

Over the years, efforts towards afforestation and forest protection greatly improved forest quality and economic value. In 1997, the Administrative Village began to redistribute the forest again. Following the lessons learned from the previous redistribution, the forest was allocated in the form of shares, entitling each individual to 0.1533 ha. The allocated forest was delineated and given to different collective forest farms, who took responsibility for its management and harvest, and the distribution of benefits from harvests was discussed. The benefits were either distributed to individuals as cash or invested in public goods. Over the years, the village used the profits from forest harvesting for infrastructure and social development, including a school, a clinic building, elders' centers, and roads, as well as covering social insurance for all villagers. In 2004, Tengchong County was selected as a pilot site in Yunnan Province for the second round of national forest tenure reform. As farmers preferred the previous tenure arrangement for collectively managing the forest, the key focus of this reform in Xinqi was forestland certification and boundary clarification instead of the forest privatization being pushed by the state in other locations. While there are several changes in forest policy, Xinqi continue their practice in community forestry. As we discuss below, the motivation to continue with collective management, despite a policy environment that encourages individualization, is not only linked to livelihood transition away from farming but also to prevailing social values and justice norms.

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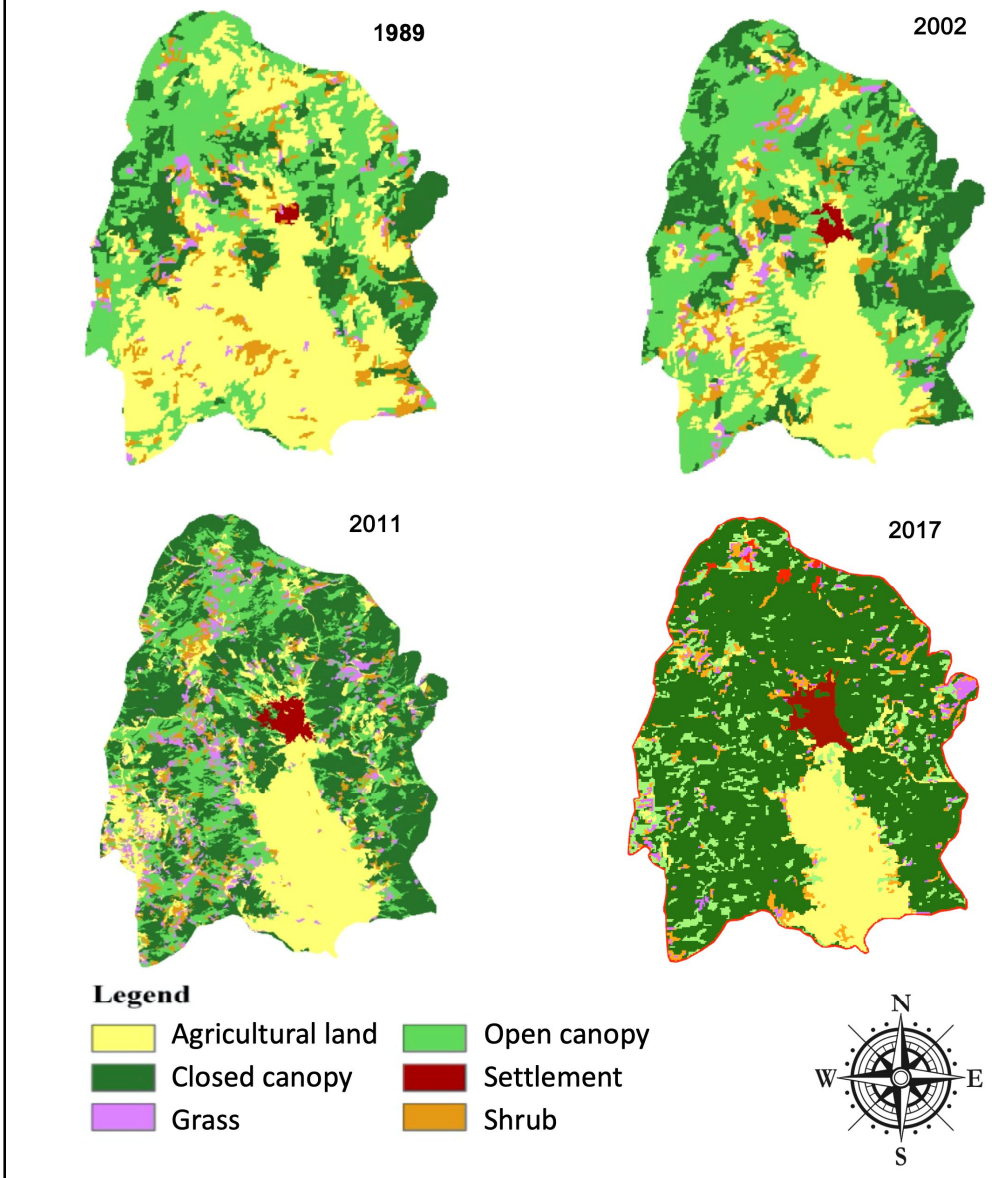
4.2 Ecological and economic returns from community forestry in Xinqi

In Xinqi, the community forestry practice has generated positive ecological and economic outcomes. Forest cover has continuously increased over time, starting from 47% of the total village area in 1989 and increasing to 62% in 2002. It remained at that level until 2011 before further increasing to 78% in 2017 (Figure 3, Table A1). Notably, in 2017, closed canopy forest was the dominant type of land use, accounting for 66% of the total land area. The largest scale conversion of agricultural land to forest occurred between 1989-2002, with a loss of 927 ha of agricultural land (accounting for 17.4% of the total land area). During implementation of the SLCP in Xinqi from 2002 to 2011, the area of agricultural land reduced by a further 187 ha (3.5% of the total land area). This was then reduced by a further 490 ha between 2011 and 2017, accounting for 9.2% of the total land area.


1989
2002
2011
2017
Legend
Agricultural land
Open canopy
Closed canopy
Settlement
Grass
Shrub
N
W
E
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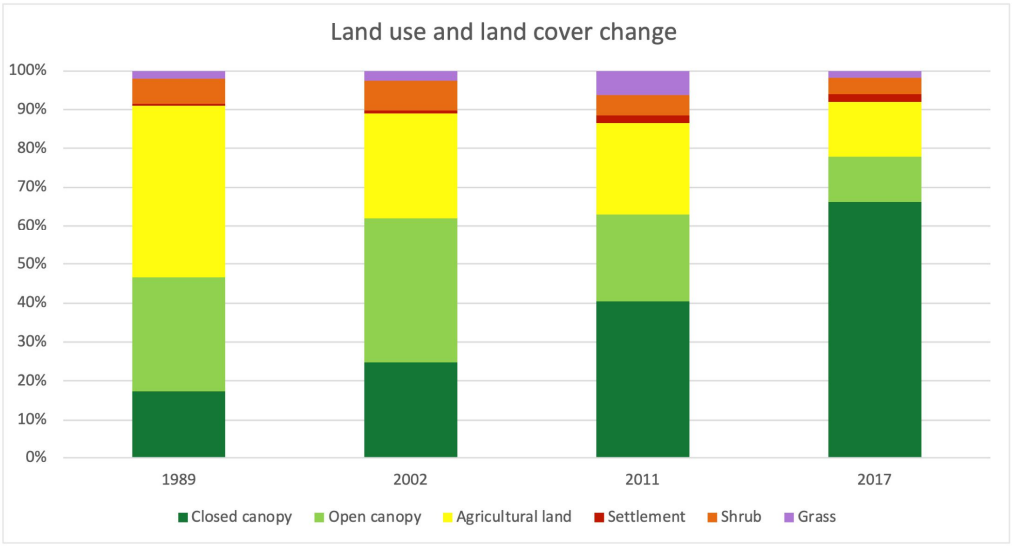
Land use and land cover change
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1989
2002
2011
2017
Closed canopy
Open canopy
Agricultural land
Settlement
Shrub
Grass

Figure 3. Land use and land cover change in Xinqi - 1989, 2002, 2011, and 2017

Closed canopy forest dramatically increased from 40.4% to 66% of Xinqi's total land area between 2011 and 2017, corresponding with a reduction in open canopy forest from 22.6% to 11.6% and agricultural land from 23.5% to 14.3%. This suggests that the increase in closed canopy forest was a result of additional planting in the open canopy forest areas and afforestation of agricultural land (Figure 3, Table A1). Figure 3 also shows that grass and shrub areas have remained at almost the same proportion of land cover, but with different distributions over time. This indicates that selective logging has occurred during different time periods, while the previously logged areas were replaced by new plantations. Thus, community forestry contributes significantly to high level of forest cover in Xinqi with only little contribution from state afforestation investment. The community has continuously retained its forests and selectively logged mature forests for community development.

The change in Xinqi's local livelihood dynamics and farming systems corresponds with China's overall economic growth, which has significantly benefited local income generation. The net income per capita in Xinqi increased 30-fold between 1989 and 2016, from 314 CNY to 10,476 CNY[22], according to village statistics. In 1989, most villagers' income was below the national poverty line, but by 2016 most were in a much better financial position.

Community forestry not only contributes directly to the local economy, but also diversifies local livelihood strategy along with land use change. The overall Chinese economic growth coincided with villagers' livelihood transitions towards non-farm income, as the conversion of agricultural land to forest provided more opportunities for off-farm activities, which now comprise a significant proportion of local household income[23]. The change from annual agriculture to forestry provided an important source of income whilst also freeing up farm labor for non-farm activities outside the village. As reported, over 51.7% households have more than two people who spent 7.19 and 9.15 months a year in off-farm job (He et al. 2014). The income from off-farm job made up to 60% local cash income, while benefits from forest including walnut, camelia oil and timber harvest consisted of another 30% of local income in average, as stated by village head. Thus, villagers are now willing to combine investing more in forestry as a long-term livelihood strategy and investment in smaller-scale, intensive agriculture as a short-term strategy. While harvesting timber requires time, the annual harvests of walnut and camellia seed comprise important income sources. Xinqi's community forestry has evidently led to increased local forest cover whilst directly and indirectly contributing to household livelihood improvements.

5. The lens of environmental justice in Xinqi

In this section, we show that the continued preference for community forestry is not only explained by this fit with economic livelihood transition, but also because it fits with local ideas of environmental justice. We examine how three

dimensions of justice (distributive, procedural and recognition) norms within the village contribute to a preference for and ultimately the success of community forestry.

5.1 Distributive justice

Distributive justice in the form of benefit sharing is a primary consideration in community forestry to ensure community members are incentivized to actively manage the forest (McDermott et al., 2009; Oldekop et al., 2010). However, norms of justice can be highly variable and dependent on local conditions (Martin et al., 2014). For this reason, we examined local norms by exploring the prevalence of the distributive justice criteria set out in section 3.2: i) prioritize the poor, ii) distribute equally, iii) invest in community/public goods, iv) compensation for opportunity costs, and v) reward those who contribute most to forest governance (Figure 4). This exploration of benefit-sharing criteria allows us to identify aggregate preferences and the achieved alignment with forestry practices.

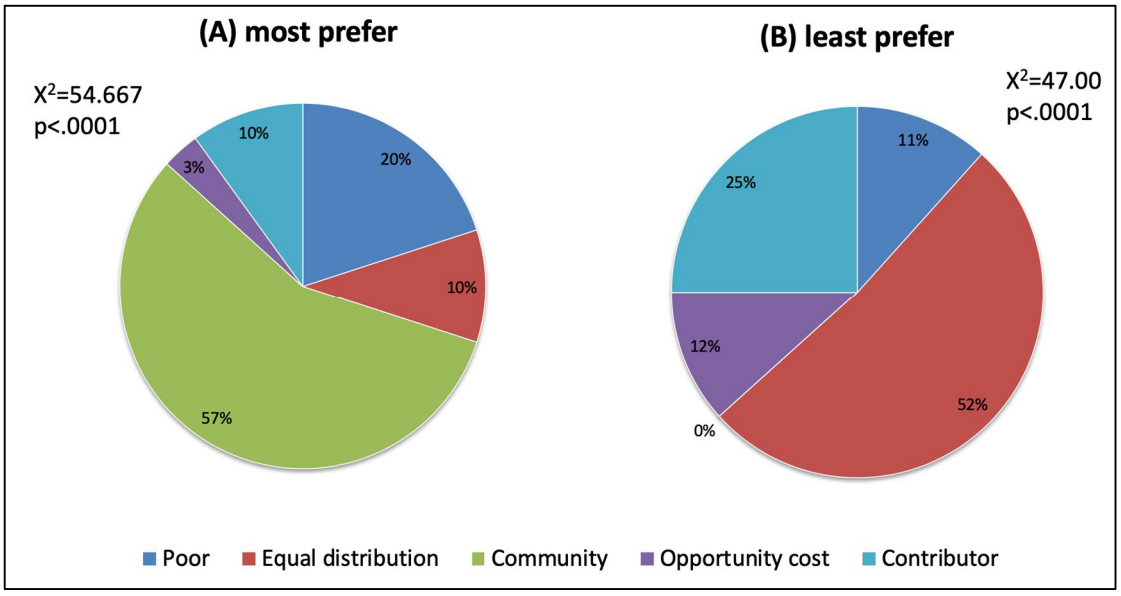

Figure 4. Farmers' preferences for the allocation of forest revenue

Source: Village survey 2015, N=60 (Female=11, Male=49)

As Figure 4 (a) shows, most farmers (57%) preferred to see the benefits used for the community/public goods. The Chi-square testing found the farmers' preference for this benefit distribution was significant at $p<0.0001$ (Chi-square=54.667.81, d.f.=4). Many farmers stated that using the funds for community-based infrastructure and other public goods is the fairest way for everybody to benefit, but that there is also a need to help the poor when the village is developing (the sum of those two options accounts for 77% of preferences). One villager described their preference for community/public goods benefit distribution by stating:

> We used those revenues (from the collective forest) as a public fund for public goods. We built temples, clinics, schools, and

> roads by using revenues from the timber harvest [in the collective forest]. We also brought health insurance for everybody by using those revenues. We think this is more fair, as everybody needs to walk on those roads, send kids to school, go to the clinic. (March 2, 2015 in Xinqi)

On the other hand, Figure 4 (b) shows that the least preference for use of the forest benefits was equal distribution among villagers, which accounted for 52% of farmer responses. The next least preferred benefit distribution method was for rewarding the dominant contributors (25%). There was much lower preference for both the opportunity cost and poor methods of benefit distribution (12% and 11%, respectively). It is noteworthy that no farmers selected the community method as their least preferred method. The chi-square testing among the group of least preference shows its statistically significant level at $p<0.001$(Chi-square=47.00, d.f.=4). Farmers considered the equal distribution principle for distributing forest revenue to be fair but thought that it would cause problems. For example, this method was perceived to result in a lack of funds being available for public goods, like building roads and installing water pipes. As one farmer stated: "…it would be difficult to pool the money from individual pockets, so we need those public fund, there is always somebody who does not want to contribute…." Also, farmers were not in favor of distributing benefits to the dominant contributors, as they are employees of the collective forest farm who are already paid for the work they perform.

In practice, the actual distribution mechanism is aligned with the participants preferences, which give collective/public fund as priority. Thus, Xinqi is able to have sufficient funds from forest harvesting to invest in infrastructure and social development, including a school, a clinic building, elders' centers, and roads, as well as covering social insurance for all villagers.

It can be seen that the "justice" criteria (as we have framed them) evolve in pragmatic ways. Distribution of equal shares finds little support among villagers, not because it is inherently unfair, but because it would leave the village with a significant logistic difficulty in collecting money for public works, which they know from past experience can itself be divisive. Thus, their distributional norms are strongly shaped by an understanding of what will best serve collective action. In sum, local perceptions of distributive justice are framed based on a strong sense of collectivity. Also, those norms of justice exactly overlap with the community's current practice for forest benefit allocation, which involves using forest revenues for public goods and poor people. This alignment between preferred justice criteria and the norms embodied in governance practices serves to legitimize community forestry in cultural and pragmatic ways that incentivize the local people to invest in afforestation that increases forest cover.

5.2 Procedural justice

Here, we examined local norms for procedural justice by looking at preferred decision-making criteria using the options outlined in section 3.2: decision-making by i) village leaders, ii) community, iii) township official, and iv)

private sector. As Figure 5 (a) shows, the community/village assembly was by far the greatest preference for the distribution procedure (76%). Village leaders was the second highest preference at 21%. Very few (3%) preferred township officials and no farmers preferred the private sector. The Chi-square testing among the group of most preference shows its significant level at $p<0.0001$ (Chi-square=90.60, d.f.=3). The private sector was also the most selected option for the least preferred distribution procedure (92%). The remaining farmers stated they had the least preference for the procedure to involve township officials (8%). The Chi-square testing among the groups of least preferences show the significant level at $p<0.0001$ (Chi-square=143.33, d.f.=3). Results of both the most and least preferred benefit distribution procedures show a clear preference for self-governance for the community forestry.

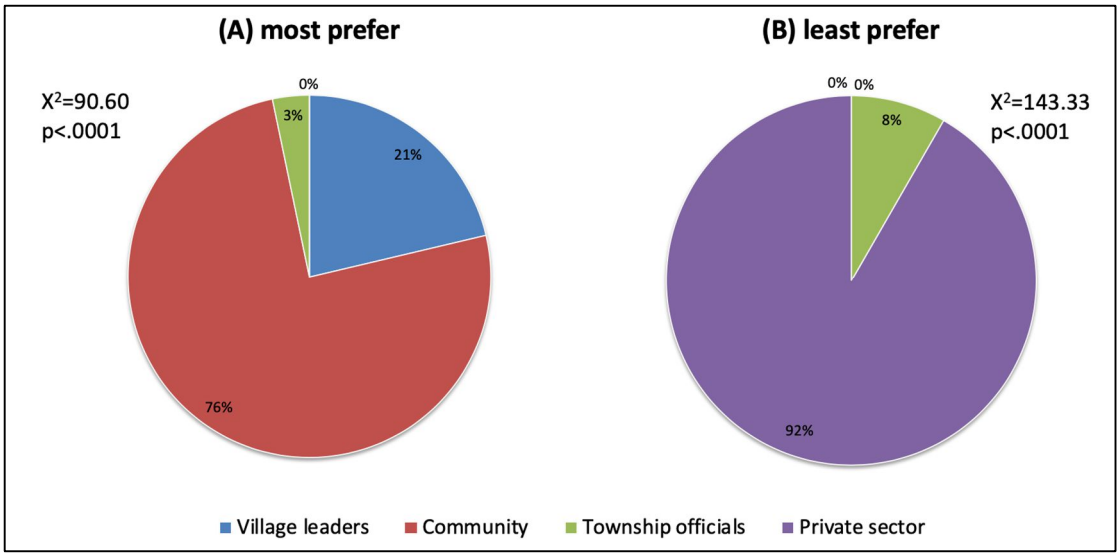

Figure 5. Farmers' preferences for benefit distribution procedure
Source: Village survey 2015, N=60 (Female=11, Male=49)

Information obtained from the in-depth interviews pointed to the farmers having a strong belief that the community as a whole should be the basis for collective decision-making. Current practice is that any decision must be approved by at least two-thirds of the total population. Some farmers also stated that village leaders from the village committee can propose plans for revenue distribution but that these need to be approved by the village assembly. One farmer also stated how this works:

> We have a good decision-making mechanism for using the public funds from the forest. There is always a proposal from the village committee (consisting of seven village leaders), then they will ask for feedback from the village representatives … the revised proposal will be posted to let everybody know. Then a village assembly will be organized to approve, reject, or ask for revising the proposal. I think it is transparent and everyone can be involved in decision-making. (December 25, 2013 in Xinqi)

To sum up, the procedural justice that local people perceived are based on a strong sense of collectivity. Also, those norms of procedural justice exactly overlap with the community's current practice of decision-making mechanisms. This alignment between preferred procedural justice criteria and the norms embodied in community decision-making practices to provide the motivation for investment in afforestation that increases forest cover and local benefit from community forestry.

5.3 Recognition justice

5.3.1. Intra-village recognition

Within Xinqi, views about the justice dimension of recognition are strongly linked to views about distribution, especially as views about intergenerational justice are legitimized through recognition of Confucian values towards elders and ancestors as particular subjects of justice. The village has traditionally allowed the elders to manage three village Confucian temples, and the elders can use donations from the temples to support elderly people. In 2001, with the support of villagers, a formal Elder Association was established, with all elderly people (i.e., aged 60+) automatically enrolled as members. When it was established, following approval by the village assembly, the assembly allocated a 40-ha piece of a very valuable camellia forest to the Elder Association for managing. These camellia forests generate about 50,000 CNY (about 8,000 USD) annually from sales of camellia oil. Therefore, an oil production facility was established with the investment from village public funds. The Elder Association hires the most physically active people from the group to operate the oil production facility and manage the forest. Younger people from many members' households are also involved as volunteers for pruning and fire control, and harvesting oil seed, which is recognized as a valuable contribution to the association.

The Elder Association has now established a communal fund that is separate from the village public fund, using the revenues generated from camellia oil production. The money is used for the association's own activities, including payments to each member as a pension-liked scheme, supporting ill members by covering some of their hospital costs, or organizing other activities. During the Spring Festival, the association also uses the funds to buy gifts like milk and cookies for the members over 85 years old and disabled elders. In 2017, the funds were also used to pay for association members to visit Tengchong city as tourists.

The intergenerational recognition has also been strongly expressed by village youths who supported the village decision to provide the Elder Association with access to the camellia forest. The young people believe this is a fair way to repay the elders for their past significant contributions to the community forestry. Two village youths stated:

> Why we have such a good forest in Xinqi is because our ancestors and the elders started afforestation many years ago … about in the 1950s. Now, we can benefit a lot from this collective forest. There is a need to pay back to those elders who contributed a lot for our forestry development. We think giving them the most valuable camellia forest is a way we pay back to the elders. (December 25, 2013, in Xinqi)
>
> It is good to give older (people) the camellia forest. They are more respectful … Also, all the camellia forests were planted by those elders in history … The village community gives the camellia forest to elders also consider that camellia tea is easier for elders for harvesting and managing than the timber forest. So, the elder (people) can benefit from selling the oil and seeds every year. But timber forest is more hard work that will be difficult for elders to manage and benefit. So, in this case, timber is not sustainable for the older people. (March 25, 2016, in Xinqi)

The picture that emerges is a strong inter-connection between the principles of recognition and of distribution, such that justifications for allocating camellia forests to the Elders Association is based on a merging of distributional criteria (reward for past contribution), cultural recognition (Confucian respect for elders) and pragmatism (camellia forest can be more easily managed by elders). Again, the key point here is not so much the particularities of local forest-related norms as the collective capability to align these norms with practices – or perhaps more accurately, the freedom to co-produce forest norms and practices.

5.3.2 External recognition

This capability to align norms with practices is in large part explained by the unusual degree to which Xinqi's forestry knowledge and expertise is recognized by state agencies. This has been critical because when implementing many national forest policies, the local officials have allowed for flexibility so that Xinqi has the freedom to practice forestry differently than other villages. For example, compared to other villages, Xinqi has never had a problem with obtaining a forest harvest quota to log their collective forest. The harvest quota is a means of highly centralized forest management control by the county government (He, 2016). But in Xinqi, the local forest department has always provided a sufficient harvest quota for the community forest, as described by a forest official:

> The quota system is used to control overharvesting (of timber); Xinqi never has this problem. They always have a plan for selective logging, and immediately planting after the logging. So, we never see deforestation in Xinqi, and I think they have achieved so-called "sustainable forestry management" … we need to be favorable to them for quota allocation, which also gives them opportunities to develop their village's collective economy [public funds]. (December 23, 2013, in Tengchong)

The most important event for recognizing community forestry in Xinqi was government allowance for flexible implementation of China's Collective Forest Tenure Reform. In 2006, the national government was pushing this tenure reform to allocate collective forests to individual households, essentially a form of forest privatization. However, this privatization did not take place in Xinqi, and the village has retained its forest as a collective holding that is also managed collectively. As most villagers remembered, a task team from the government came to discuss with the village committee how the collective forest could be distributed to individuals. But given the importance of the collective forest for funding the village's public goods, no-one wanted to distribute the forest to individual households. In the village assembly, farmers asked the village leaders to discuss with forest officials the possibility of keeping the forest as a collective holding. The village committee negotiated with local officials by referring to the policy document that states household allocations can only occur when at least two-thirds of villagers approve. As most villagers did not agree with the household allocations, Xinqi was able to retain its collective forest. After discussion among the officials, the local government wrote a report to the county government recommending that Xinqi retains its collective forest. This recommendation was eventually approved, as recalled by a county forest official:

> …We have considered this case [Xinqi's case] several times, as there is contradiction. While [central] government required allocation of collective forest, the village wants to keep their forest as a collective. But we know the ultimate goal from both sides is to have good forest management. Xinqi already has good practice, we need to recognize and encourage them. So, we approved their report to keep the forest as a collective, and now their unique management practice has been recognized by even provincial government…. (March 31, 2016, in Tengchong)

The internal recognition among the villagers has helped to build a harmonious relationship among farmers, which has helped to support the procedural and distributive justice. The internal recognition also includes Confucian culture that underpins care for elders, which cuts across distribution and recognition. This recognition has made an important contribution to obtaining legitimacy from villagers to support the collective action for community forestry. This alignment of culture with forest practice has only been possible due to the external recognition from government officials, which has led them to provide political support to recognize Xinqi's unique institutional arrangements and successes with community forestry practice. The external recognition provides the policy environment to enable villagers to align their justice norm with community forestry. With this recognition, community forestry in Xinqi has obtained legitimacy, both internally and externally.

6. Discussion and conclusion

Adding to existing theories on community forestry, this paper examined the success of community forestry from an environmental justice perspective. Rather than re-examining documented factors influencing success (i.e., community characteristics, institutions, level of decentralization, and property regime) (e.g., Pagdee et al., 2006; Baynes et al., 2015; Hajjar et al., 2016), the research takes a novel approach to reveal how locally embedded and shared justice norms and practices of distribution, participation, and recognition have supported collective actions that positively contribute to economic and environmental returns from community forestry. Drawing from the research findings, the theoretical and empirical implications encompass three aspects.

First, the insights from this study highlight the need to consider justice in analyses of community forestry or common-pool resource management more broadly. As an addition to Ostrom's "Eight Design Principles" (Ostrom, 1990, 2007, 2009) for sound institutional building, this research suggests that justice norms and practices become important conditions for establishing sound institutions that support sustainable development. As shown in the case of Xinqi, this does not appear as a simple causality in which meeting justice conditions leads to successful community forestry. What is shown is that local ideas of justice emerge as key elements of the design and practice of collective management. Building and maintaining local capability to implement these ideas in this case has been a important factor contributed to sustainable community forestry. The institutions that support sustainable community forestry develop when villagers are able to align forest management with local justice norms. Such alignment with shared justice norms helps the institution to obtain local legitimacy (Martin et al., 2018) and can ensure the institution is well designed and works effectively. This finding has also been observed by scholars of institutional building for payments for environmental services (e.g., Martin et al., 2014; He & Sikor, 2015; Fisher et al., 2018) and management of other common-pool resources like climate (e.g., Schlosberg & Collins, 2014; Schroeder & McDermott, 2014), and water (e.g., Zeitoun et al., 2014; Neal et al., 2014).

Second, the research supports the discussion around local justice norms that are historically and culturally embedded; they are not exogenous in any sense, but rather conditioned by the historical relations among stakeholders and reflect the influence of local contexts (Martin et al., 2014; Sikor et al., 2014). As shown in Xinqi, people consider the communal distribution of benefits for public goods and the recognition of elders as more just, which is different from the influential understandings of justice as egalitarian or a resource for future generations stated in Brundtland Report (World Commission on Environment and Development, 1987). As Martin et al. (2014) observed, the locally embedded and historical nature of justice norms requires particular consideration of local contexts and specificity. Thus, the justice norm is localized, and it is practical and informal but is more effective than official and formal norms introduced externally (Acharya, 2014; Olivier de Sardan, 2013). These local historical and context specificities are particularly important for collective action to be

achieved, but have not received sufficient attention in either the "Eight Design Principles" (Ostrom, 1990, 2009) or analyses of key factors influencing community forestry success (e.g. Pagdee et al., 2006; Baynes et al., 2015; Hajjar et al., 2016).

Third, the research also observed that the three dimensions of justice are mutually supportive and interlinked, rather than separate, as suggested elsewhere (Sikor et al., 2014). As shown in Xinqi, farmers' participation in decision-making leads to the distribution of forest revenue for public goods, and the intergenerational recognition facilitates inclusion of different generations in benefit-sharing and decision-making. Redistribution of revenues to public fund supports collective decision-making and successful distribution and good forest management particularly support the external recognition. Notably, the external recognition might not come about automatically, as seen in this case study. To be adequately recognized might require power struggles and negotiations, which are dynamic aspects of environmental justice norms; it is what Acharya (2014) called multi-ideas and actors involved in norm making. In Xinqi, although the local farmers' unique communal management practice had been recognized by the local government, official recognition by higher levels of government required local bargaining for power to avoid their practices being undermined by the privatization of forest tenure. Thus, an understanding of power relations is also important in considering justice norms. This can help to provide a better explanation of how the mutually supportive and interlinked three dimensions of justice have led to the success of community forestry in Xinqi.

In conclusion, apart from additions to existing theories on community forestry, the empirical implications from this paper are also important, particularly when governmental, intergovernmental, and nongovernmental organizations are investing in community forestry or common-pool resource management. First, the norms of justice need to be considered as important for sustainability of any community forestry program, being a foundation for the type of local institutions that can be designed, how these institutions can work effectively, and how they can obtain legitimacy. Second, as for any community forestry initiative, there is a need to understand the local historical and cultural contexts of justice norms. These norms of justice are locally embedded and may be very different or partially overlap with the justice norms followed by outsiders. Finally, and most importantly, external support for the recognition dimension of environmental justice is required. This is to ensure not only recognition of local cultures and ethnic differences, but also local knowledge and practices in community forestry management.

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References

Acharya, A. (2014). Who Are the Norm Makers-The Asian-African Conference in Bandung and the Evolution of Norms. *Global Governance, 20*, 405.

Agrawal, A., & Chhatre, A. (2006). Explaining success on the commons: Community forest governance in the Indian Himalaya. *World Development, 34*(1), 149–166.

Agrawal, A., Chhatre, A., & Hardin, R. (2008). Changing governance of the world's forests. *Science, 320*(5882), 1460–1462.

Agrawal, A., & Ostrom, E. (2001). Collective action, property rights, and decentralization in resource use in India and Nepal. *Politics & Society, 29*(4), 485–514.

Andersson, K. (2013). Local governance of forests and the role of external organizations: Some ties matter more than others. *World Development, 43*, 226–237.

Andersson, K. P., Benavides, J. P., & Leon, R. (2014). Institutional diversity and local forest governance. *Environmental Science and Policy 36*, 61–72.

Andersson, K. P., Gibson, C. C., & Lehoucq, F. (2006). Municipal politics and forest governance: Comparative analysis of decentralization in Bolivia and Guatemala. *World Development, 34*(3), 576–595.

Arts, B., & De Koning, J. (2017). Community forest management: An assessment and explanation of its performance through QCA. *World Development, 96*, 315–325.

Baggio, J. A., Barnett, A. J., Perez-Ibara, I., Brady, U., Ratajczyk, E., Rollins, N., Rubiños, C., Shin, H. C., Yu, D. J., Aggarwal, R., Anderies, J. M., & Janssen, M. A. (2016). Explaining success and failure in the commons: the configural nature of Ostrom's institutional design principles. *International Journal of the Commons, 10*(2), 417–439.

Balooni, K., & Lund, J. F. (2014). Forest rights: the hard currency of REDD+. *Conservation Letters, 7*(3), 278–284.

Baynes, J., Herbohn, J., Smith, C., Fisher, R., & Bray, D. (2015). Key factors which influence the success of community forestry in developing countries. *Global Environmental Change, 35*, 226–238.

Baland, M., Platteau, J. P. (1996). *Halting degradation of natural resources: Is there a role for rural communities?*. Clarendon Press.

BenYishay, A., Heuser, S., Runfola, D., & Trichler, R. (2017). Indigenous land rights and deforestation: Evidence from the Brazilian Amazon. *Journal of Environmental Economics and Management, 86*, 29–47. https://doi.org/10.1016/j.jeem.2017.07.008

Blackman, A., Corral, L., Lima, E. S., & Asner, G. P. (2017). Titling indigenous communities protects forests in the Peruvian Amazon. *Proceedings of the National Academy of Sciences, 114*(16), 4123–4128.

Bowler, D. E., Buyung-Ali, L. M., Healey, J. R., Jones, J. P., Knight, T. M., & Pullin, A. S. (2012). Does community forest management provide global environmental benefits and improve local welfare?. *Frontiers in Ecology and the Environment, 10*(1), 29–36.

Buntaine, M. T., Hamilton, S. E., & Millones, M. (2015). Titling community land to prevent deforestation: An evaluation of a best-case program in Morona-Santiago, Ecuador. *Global Environmental Change, 33*, 32–43.

Casari, M., & Tagliapietra, C. (2018). Group size in social-ecological systems. *Proceedings of the National Academy of Sciences, 115*(11), 2728–2733.

Cleaver, F. (2012). *Development through bricolage: rethinking institutions for natural resource management*. Routledge.

Colfer, C. J. P., & Capistrano, D. (Eds.). (2005). *The politics of decentralization: forests, people and power*. Earthscan.

Cox, M., Arnold, G., & Tomas, S. V. (2010). A review of design principles for community-based natural resource management. *Ecology and Society, 15* (4), 38.

Cronkleton, P., & Larson, A. (2015). Formalization and collective appropriation of space on forest frontiers: comparing communal and individual property systems in the Peruvian and Ecuadoran Amazon. *Society & Natural Resources, 28*(5), 496–512.

Dawson, N., Martin, A., & Danielsen, F. (2018). Assessing equity in protected area governance: approaches to promote just and effective conservation. *Conservation Letters, 11*(2), e12388.

De Jong, W., Pokorny, B., Katila, P., Galloway, G., & Pacheco, P. (2018). Community forestry and the sustainable development goals: A two way street. *Forests, 9*(6), 331.

Di Gregorio, A., & Jansen, L. J. M. (2000). *Land Cover Classification System (LCCS): Classification Concepts and User Manual*. Food and Agriculture Organization of the United Nations.

Fisher, J. A., Cavanagh, C. J., Sikor, T., & Mwayafu, D. M. (2018). Linking notions of justice and project outcomes in carbon offset forestry projects: Insights from a comparative study in Uganda. *Land Use Policy, 73*, 259–268.

Gutierrez Rodriguez, L., Hogarth, N. J., Zhou, W., Xie, C., Zhang, K., & Putzel, L. (2016). Chinas conversion of cropland to forest program: A systematic review of the environmental and socioeconomic effects. Environmental Evidence, 5,21

Hajjar, R., Oldekop, J. A., Cronkleton, P., Etue, E., Newton, P., Russel, A. J., Tjajadi, J. S., Zhou, W., & Agrawal, A. (2016). The data not collected on community forestry. *Conservation Biology, 30*(6), 1357–1362.

Hajjar, R., & Oldekop, J. A. (2018). Research frontiers in community forest management. *Current Opinion in Environmental Sustainability, 32*, 119–125.

He, J. (2020a) Situated Payments for Ecosystem Services: Local Agencies in the implementation of the Sloping Land Conversion Programme in Southwest China. Development and Change, 51(1): 73-93

He, J. (2020b) Institutional bricolage in payment for environmental services: insights from the Sloping Land Conversion Programme in upland communities, Southwest China. Asia Pacific Viewpoint, https://doi.org/10.1111/apv.12298

He, J. (2016). Rights to benefit from forest? A case study of the timber harvest quota system in southwest China. *Society & Natural Resources, 29*(4), 448–461.

He, J., Kebede, B., Martin, A., & Gross-Camp, N. (2020). Privatization or communalization: A multi-level analysis of changes in forest property regimes in China. *Ecological Economics, 174*, 106629.

He, J., Lang, R., & Xu, J. (2014). Local dynamics driving forest transition: insights from upland villages in Southwest China. Forests, 5(2), 214-233.

He, J., & Sikor, T. (2015). Notion of justice in payments for ecosystem services: Insights from China's Sloping Land Conversion Program in Yunnan Province. *Land Use Policy, 43*, 207–216.

Ho, P. (2001). Who owns China's land? Policies, property rights and deliberate institutional ambiguity. *The China Quarterly, 166*, 394–421.

Kahsay, G. A., & Bulte, E. (2019). Trust, regulation and participatory forest management: Micro-level evidence on forest governance from Ethiopia. *World Development, 120*, 118–132.

Khatun, K., Gross-Camp, N., Corbera, E., Martin, A., Ball, S., & Massao, G. (2015). When Participatory Forest Management makes money: insights from Tanzania on governance, benefit sharing, and implications for REDD+. *Environment and Planning A, 47*(10), 2097–2112.

Larson, A. M., Barry, D., & Dahal, G. R. (Eds.). (2010). *Forests for people: Community rights and forest tenure reform*. Earthscan.

Li, J., M. W. Feldman, S Li, G. C. Gaily. (2011). Rural household income and inequality under the Sloping Land Conversion Program in western China. *Proceedings of the National Academy of Sciences* 108(19): 7721-7726.

Liu, P., & Ravenscroft, N. (2016) Collective action in China's recent collective forestry property rights reform. *Land Use Policy, 59*, 402 –411.

Loh, J., & Harmon, D. (2005). A global index of biocultural diversity. *Ecological Indicators, 5*(3), 231–241.

Lund, J. F., Rutt, R. L., & Ribot, J. (2018). Trends in research on forestry decentralization policies. *Current Opinion in Environmental Sustainability, 32*, 17–22.

Lund, J. F., & Saito-Jensen, M. (2013). Revisiting the issue of elite capture of participatory initiatives. *World Development, 46*, 104–112.

Ma, H., Y. Lu, Y. Xing, G. He, Y. Sun. (2009). Rural Households' Attitude and Economic Strategies toward the Conversion of Cropland to Forest and Grassland Program (CCFG): A Case Study in Qira, China. *Environmental Management* 43(6): 1039-1047.

Martin, A. (2017). *Just conservation: Biodiversity, wellbeing and sustainability.* Taylor & Francis.

Martin, A., Coolsaet, B., Corbera, E., Dawson, N. M., Fraser, J. A., Lehmann, I., & Rodriguez, I. (2016). Justice and conservation: the need to incorporate recognition. *Biological Conservation, 197*, 254–261.

Martin, A., Gross-Camp, N., Kebede, B., McGuire, S., & Munyarukaza, J. (2014). Whose environmental justice? Exploring local and global perspectives in a payments for ecosystem services scheme in Rwanda. *Geoforum, 54*, 167–177.

Martin, A., Kebede, B., Gross-Camp, N., He, J., Inturias, M., & Rodríguez, I. (2019). Fair ways to share benefits from community forests? How commodification is associated with reduced preference for equality and poverty alleviation. *Environmental Research Letters, 14*(6), 064002.

Martin, A., Myers, R., & Dawson, N. M. (2018). The park is ruining our livelihoods. We support the park! Unravelling the paradox of attitudes to protected areas. *Human Ecology, 46*(1), 93–105.

Martin, A. (2013) Global environmental in/justice, in practice: introduction. The Geographical Journal, 179(2): 98-104.

Martin, A., McGuire, S., Sullivan, Sian. (2013). Global environmental justice and biodiversity conservation, 179 (2):122-131.

Martinez-Alier, J. (2003) *The Environmentalism of the Poor: a study of ecological conflicts and valuation*. Edward Elgar Publishing.

McDermott, M., Mahanty, S., & Schreckenberg, K. (2013). Examining equity: a multidimensional framework for assessing equity in payments for ecosystem services. *Environmental Science & Policy, 33*, 416–427.

McDermott, M. H., & Schreckenberg, K. (2009). Equity in community forestry: insights from North and South. *International Forestry Review, 11*(2), 157–170.

Mukherjee, P., Ray, B., & Bhattacharya, R. N. (2017). Status differences in collective action and forest benefits: evidence from joint forest management in India. *Environment, Development and Sustainability, 19*(5), 1831–1854.

Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature, 403*(6772), 853.

Neal, M. J., Lukasiewicz, A., & Syme, G. J. (2014). Why justice matters in water governance: some ideas for a 'water justice framework'. *Water Policy, 16*(S2), 1–18.

North, D.C. (1990) Institutions, Institutional Change and Economic performance. Cambridge University Press.

Ojha, H. R. (2014). Beyond the 'local community': the evolution of multi-scale politics in Nepal's community forestry regimes. *International Forestry Review, 16*(3), 339–353.

Oldekop, J. A., Bebbington, A. J., Brockington, D., & Preziosi, R. F. (2010). Understanding the lessons and limitations of conservation and development. *Conservation Biology, 24*(2), 461–469.

Olivier de Sardan, J. P. (2013). Embeddedness and informal norms: Institutionalisms and anthropology. *Critique of Anthropology, 33*(3), 278–297.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press.

Ostrom, E. (2007). A diagnostic approach for going beyond panaceas. *Proceedings of the National Academy of Sciences, 104*(39), 15181–15187.

Ostrom, E. (2009). *Understanding institutional diversity*. Princeton University Press.

Pagdee, A., Kim, Y. S., & Daugherty, P. J. (2006). What makes community forest management successful: a meta-study from community forests throughout the world. *Society and Natural Resources, 19*(1), 33–52.

Pascual, U., Phelps, J., Garmendia, E., Brown, K., Corbera, E., Martin, A., Gomez-Baggethun, E., & Muradian, R. (2014). Social equity matters in payments for ecosystem services. *Bioscience, 64*(11), 1027–1036.

Paudel, D. (2016). Re-inventing the commons: community forestry as accumulation without dispossession in Nepal. *The Journal of Peasant Studies, 43*(5), 989–1009.

Porter-Bolland, L., Ellis, E. A., Guariguata, M. R., Ruiz-Mallén, I., Negrete-Yankelevich, S., & Reyes-García, V. (2012). Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics. *Forest Ecology and Management, 268*, 6–17.

Poteete, A. R., & Ostrom, E. (2004). Heterogeneity, group size and collective action: The role of institutions in forest management. *Development and Change, 35*(3), 435–461.

Rasolofoson, R. A., Ferraro, P. J., Jenkins, C. N., & Jones, J. P. (2015). Effectiveness of community forest management at reducing deforestation in Madagascar. *Biological Conservation, 184*, 271–277.

Ribot, J. C., Agrawal, A., & Larson, A. M. (2006). Recentralizing while decentralizing: how national governments reappropriate forest resources. *World Development, 34*(11), 1864–1886.

Ribot, J. C., Lund, J. F., & Treue, T. (2010). Democratic decentralization in sub-Saharan Africa: its contribution to forest management, livelihoods, and enfranchisement. *Environmental Conservation, 37*(1), 35–44.

Robbins, A. S., & Harrell, S. (2014). Paradoxes and challenges for China's forests in the reform era. *The China Quarterly, 218*, 381–403.

Robinson, B. E., Holland, M. B., & Naughton-Treves, L. (2014). Does secure land tenure save forests? A meta-analysis of the relationship between land tenure and tropical deforestation. *Global Environmental Change, 29*, 281–293.

Rights and Resources Initiative. (2018). *A Global Baseline of Carbon Storage in Collective Lands: Indigenous and local community contributions to climate change mitigation*. Rights and Resources Initiative.

Schlosberg, D. (2004). Reconceiving environmental justice: global movements and political theories. *Environmental Politics 13*(3): 517–540.

Schlosberg, D., & Collins, L. B. (2014). From environmental to climate justice: climate change and the discourse of environmental justice. *Wiley Interdisciplinary Reviews: Climate Change, 5*(3), 359–374.

Schreckenberg, K., Franks, P., Martin, A., & Lang, B. (2016). Unpacking equity for protected area conservation. *PARKS, 22*(2), 11–26.

Schroeder, H., & McDermott, C. (2014). Beyond carbon: enabling justice and equity in REDD+ across levels of governance. *Ecology and Society, 19*(1), 31.

Shapiro, J. (2001). *Mao's war against nature: Politics and the environment in revolutionary China.* Cambridge University Press.

Sikor, T. (Ed.). (2013). *The justices and injustices of ecosystem services*. Earthscan.

Sikor, T., Martin, A., Fisher, J., & He, J. (2014). Toward an empirical analysis of justice in ecosystem governance. *Conservation Letters, 7*(6), 524–532.

Sikor, T., Newell, P. (2013) Globalizing Environmental Justice. Geoforum, 54:151-157

Sikor, T., Cam, H. (2016) REDD+ on the rocks? Conflicting over forest and politics of justice in Vietnam. Human Ecology, 44: 217-227.

Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review, 20*, 571–610.

Sundar, B. (2017). Joint forest management in India–an assessment. *International Forestry Review, 19*(4), 495–511.

Uchida, E.; Xu, J.; Xu, Z.; Rozelle, S. (2007). Are the poor benefiting from China's land conservation program? Environment Development and Economics. 12, 593–620.

Walker, G. (2012). *Environmental Justice: Concepts, Evidence and Politics*. Routledge.

Waller, L. A. (2006). *Environmental Justice. Encyclopedia of Environmentrics*. Wiley.

World Commission on Environment and Development (1987) Our Common Future. Oxford: Oxford University.

Wright, G. D., Andersson, K. P., Gibson, C. C., & Evans, T. P. (2016). Decentralization can help reduce deforestation when user groups engage with local government. *Proceedings of the National Academy of Sciences, 113*(52), 14958–14963.

Xu, J., & Ribot, J. C. (2004). Decentralisation and accountability in forest management: a case from Yunnan, Southwest China. *The European Journal of Development Research, 16*(1), 153–173.

Yang, W., Liu, W., Viña, A., Tuanmu, M. N., He, G., Dietz, T., & Liu, J. (2013). Nonlinear effects of group size on collective action and resource outcomes. *Proceedings of the National Academy of Sciences, 110*(27), 10916–10921.

Yin, R., Zulu, L., Qi, J., Freudenberger, M., & Sommerville, M. (2016). Empirical linkages between devolved tenure systems and forest conditions: Primary evidence. *Forest Policy and Economics, 73*, 277–285.

Zeitoun, M., Warner, J., Mirumachi, N., Matthews, N., McLaughlin, K., Woodhouse, M., Cascão, A. E., & Allan, T. J. (2014). Transboundary water justice: a combined reading of literature on critical transboundary water interaction and 'justice', for analysis and diplomacy. *Water Policy, 16*(S2), 174–193.

Zinda, J. A., & He, J. (2020). Ecological civilization in the mountains: how walnuts boomed and busted in southwest China. *The Journal of Peasant Studies*, 47(5): 1052-1076.

Endnotes

1 This paper adopts a definition of community forestry as a type of forest management practice with the involvement of local communities for the dual goals of forest conservation and local livelihood benefits.

2 Community forestry contributes to a range of SDGs, including SDGs 1 reducing poverty, SDG2 reducing huger, SDG3 improving health, SDG 6 clean water, SDG7 energy, SDG 13 climate change mitigation, and SDG 15 forest biodiversity (De Jong et al., 2018).

3 We consider the success of community forestry in a general sense as the achievement of forest conservation and local livelihood development with a participatory approach.

4 Common-pool resources are treated as if they were fully described by two characteristics-difficulty of exclusion and subtractability of yield (Ostrom, 1990), which are also the characteristics that community forestry has.

5 Since its proposal by Ostrom (1990), the eight design principles have been extensively examined to see whether it supported collective action for common-pool resources management (see meta-analysis by Cox et al., 2010).

6 Beyond the definitions of "rule of game" (North, 1990) and "rule-in-use" (Ostrom, 2009), we use the thinking from the school of critical institutionalism to define the institution as rules, norms, and arrangements, which can exist and be represented in the form of an organization (Cleaver, 2012). In community forestry study, the institution of community forestry is the rules, norms, and arrangements of forest management, in particular, village organization.

7 While biophysical conditions can be factors that influence community forestry, existing theories show the major role of socioeconomic factors in shaping the success of community forestry (e.g., Pagdee, 2006; Baynes et al., 2015). Thus, this research aimed to add to existing theory with its focus on socioeconomic aspects.

8 As informed by Olivier de Sardan (2013), this research takes conception of norm as the practical norm which underlies the actual pattern of governance. We consider the justice norm to be practiced locally in real life, which is different from official norms as patterns of formal, idealized, or standard behaviors and regularities of everyday life imposed by a bureaucratic body (also see the discussion from critical institutionalism, Cleaver, 2012).

9 In general, understanding, environmental justice refers to the equitable treatment and involvement of all people regardless of their race, ethnicity, income, origin, or education level in any environmental issue (Waller 2006).

10 The Chinese forestry sector has received considerable criticism for its lack of downward accountability (Xu & Ribot, 2004), highly centralized control (Robbins & Harrell, 2014), ambiguity of property rights (Ho, 2001), and lack of forest tenure security (He, 2016). Also, it is commonly understood that rural society in China is highly populated.

11 while there are overlapping and embeddedness between justice dimensions and Ostrom's designs principles, we suggest the justice lens to examine success of community forestry, which provide a more broader and powerful analytical tools to understand the forms of common-pool natural resource management.

12 We consider legitimacy as a general term to refer to "generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574).

13 As a focus on community forestry at a particular location, the subject of this paper was not extensively examined.

14 Elevation is an ALOS PALSAR product with a resolution of 12.5 m, downloaded from EARTHDATA https://earthdata.nasa.gov/ (accessed on May 22, 2020)

15 A "Natural Village" is a settlement of several households ranging from five to several hundred, while several natural villages constitute an "Administrative Village," which is the lowest administrative unit in the Chinese government structure.

16 Agroforestry was practiced by local farmers, traditionally to achieve efficiency of land use for both ecological and ecological benefit. The state afforestation program (i.e. Sloping Land Conversion Program), on the other hand, has prioritized ecological goals to establish sound forests without allowing the intercropping of annual crops (He et al., 2020).

17 In the village, a list of households provided by the village heads was coded by researchers; then approximately 60 household were selected by a simple random sampling strategy for the questionnaire survey, and we interviewed the head of the household. When the selected household was not available, we interviewed the next household on list.

18 As highly market-oriented approach forest management practice in China, we do not find the significant difference between monetary and non-monetary benefit distribution in preferences for revenues distribution as what found by Martin et al. (2019).

19 As recognition has largely been expressed in a relation to the cultural respect and self-determination, it is hard to capture from a quantitative approach, as learned from previous studies in environmental justice (e.g., Martin et al., 2014).

20 As informed by Di Gregorio and Jansen (2000) and He et al. (2014), our classification of land use system includes open

canopy forest, closed canopy forest, agricultural land, shrub, grass, settlement, and bodies of water, while forest was defined as any land use where tree cover is greater than 20%.

21 Collective Forest Farm was a type of forest management entity in the commune system during the collectivism period, which could be set up by the government at township or county level for the responsibility of afforestation and timber harvest. Here, there collective forest farm was set up by Xinqi on their own and managed collectively as early type of community forestry practice in Xinqi.

22 1 USD= 6.2 CNY in 2016

23 Similarly, there are a wide range of research documented that conversion of agriculture land to forest make significant contribution to local income through increased off-farm activities in last two decades across China (e.g. Ma et al. 2007, Uchida 2007, He and Sikor, 2015, Li et al. 2011, Gutierrez Rodriguez, et al. 2016).

Appendix

Year	1989		2002		2011		2017		1989-2002		2002-2011		2011-2017	
Class	Area(ha)	(%)	Area(ha)	(%)	Area(ha)	(%)	Area(ha)	(%)	Area(ha)	(%)	Area(ha)	(%)	Area(ha)	(%)
Closed canopy	925.11	17.39	1315.53	24.73	2147	40.4	3522	66.2	390	7.3	832	15.6	1375	25.8
Open canopy	1556.28	29.26	1986.75	37.35	1202	22.6	617	11.6	430	8.1	-785	-14.8	-585	-11.0
Agricultural land	2365.47	44.47	1438.83	27.05	1252	23.5	761	14.3	-927	-17.4	-187	-3.5	-490	-9.2
Settlement	15.03	0.28	39.96	0.75	70	1.3	76	1.4	25	0.5	30	0.6	6	0.1
Shrub	347.04	6.52	403.2	7.58	280	5.3	222	4.2	56	1.1	-123	-2.3	-58	-1.1
Grass	110.07	2.07	134.73	2.53	328	6.2	97	1.8	25	0.5	194	3.7	-231	-4.4
Mining area	0	0	0	0	39	0.7	24	0.5	0	0.0	39	0.7	-15	-0.3

Table A1. Land use and land cover change 1989-2017