Public views on the value of forests in relation to forestation projects—A case study in central Taiwan

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ABSTRACT

The purpose of this study was to understand the public's attitude toward the Reforestation in Mountain Areas (RMA) and the Afforestation in Lowland Areas (ALA) projects. Understanding the public's attitudes toward these projects could provide critical information for forest management; furthermore, their underlying values and the acquired knowledge might help collect more detailed information for these projects. Out of a total of 800 questionnaires, 724 valid questionnaires were obtained from July 2012 to March 2013; the study site was in central Taiwan. A paired t-test was used to compare the perceived forest benefits between mountain and lowland areas, and one-way analysis of variance (ANOVA) was adopted to rank the different forest values in each area. However, the relationship between forest values, forest knowledge components and attitudes toward the two projects was constructed based on cognitive hierarchical theory. Logistic regressions were employed to analyze this relationship. The result indicated that the respondents held positive attitudes toward these two projects, particularly the RMA project. Comparing the same forest values held by public in mountain and lowland areas, the scores were higher in mountain areas, and all items showed the same pattern. Meanwhile, among the forest values, the external benefits were shown to have higher priority, regardless of the area. After the logistic regression analysis, we confirmed that people's forest values and forest knowledge were possible components for forming their attitudes toward the two projects—for example, the RMA project was influenced by forest values and forest knowledge, whereas the ALA project was only influenced by forest values. Nevertheless, the logistic models were shown to perform well in the cognitive hierarchical theory framework in our study.

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1. Introduction

Due to economic growth and land development since the Industrial Revolution, changing land uses have caused environmental and ecological problems, such as air and water pollution, carbon emissions, and deforestation (Dunlap and Jorgenson, 2012). In recent decades, these problems have become increasingly serious threats, and governments and international groups have attempted to solve these issues via international agreements. In 1992, Forest Principles and Agenda 21 proposed to employ afforestation and reforestation to protect the environment and ensure sustainable development (Carle and Holmgren, 2008). Similarly, in 1997, the Kyoto Protocol emphasized the mitigation of climate change by reducing greenhouse gases, of which CO_2 is a main component. Carbon can be captured and accumulated in wood plant bodies during growth; therefore, afforestation and reforestation are regarded as a significant approach in ensuring carbon storage (Marland and Schlamadinger, 1997). In 2016, the United Nations sponsored a set of sustainable development goals (SDGs). There are 17 of them, with the goal 15 specifically addressing the increase of afforestation and reforestation as key tasks for sustainable forest management worldwide (United Nations Department of Economic and Social Affairs (UN DESA), 2016). These tasks are also becoming critical projects in the context of forest policies worldwide.

According to the report of global forest resources assessment 2015, the world's total forest cover area decreased from 4128 million ha (30.6% of global land area) in 1990 to 3999 million ha (31.6%) in 2015. Meanwhile, plantations within the total forest cover increased over 105 million ha during the same period (Food and Agriculture organization of the United Nations (FAO), 2016). It indicates a decreasing trend of world total forest cover area with a significant increment of plantations in its composition in recent years. Taiwan's forest resource stands out in contrast—the country has a noticeably higher forest cover of over 60%, approximately twice the global percentage (Taiwan Forestry Bureau (TFB), 2015). Some of this high forest cover originated from past planting projects by the Taiwanese government. The forest policy concerning forestation through subsidies has been practiced since 1983. In this program, the government offers incentives to landowners to preserve forests, which has become an important part of forestation policies. This policy is mainly practiced in two regions,

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reforestation in mountain areas (RMA) and afforestation in lowland areas (ALA). Meanwhile, different goals in these two areas have been identified; RMA aims to maintain environmental benefits, whereas ALA aims to improve the aesthetics and leisure components of the area (Lin and Liu, 2007a,b; Lin et al., 2012). The government has provided a high level of subsidies for landowners in these two projects, including basic subsidies and extra compensation. The former is offered for both the RMA and ALA projects and is equal to the cost of forestation within a 20-year period (NT$ 600,000). Extra compensation (NT$ 90,000 per year for 20 years) is only given for the ALA project because lowland areas have higher opportunity costs than mountain areas. Interestingly, we find that the basic subsidy is higher than in other countries; for example, Japan only offers 32% to 70% of the cost as a subsidy (Lin, 2003). The high subsidies for landowners demonstrated the serious intention of the Taiwanese government in implementing the RMA and ALA projects.

To execute these projects effectively, the opinions of various stakeholders, including those of experts, private forest owners, environmentalists and the general public, should be considered (Heberlein, 1989; Schaaf and Broussard, 2006; Eriksson et al., 2013). We find that many studies have discussed the opinions of private forest owners and professionals on the RMA and ALA projects (Jen and Lin, 1997; Jen et al., 1998; Yen et al., 2002; Lee et al., 2003; Yen et al., 2004; Lin and Liu, 2007a,b; Yen et al., 2007a,b; Lin et al., 2009), whereas few have addressed the opinions of the general public in Taiwan (Lin et al., 2012; Chen and Yen, 2013). However, the general public's opinions play a critical role in policy making because the benefits of RMA and ALA have strong links to Taiwanese citizens.

In general, public opinions toward policy can be measured by the public's beliefs (value orientation) and attitudes based on the cognitive hierarchical theory (Fulton et al., 1996; Mcfarlane and Boxall, 2000; Tarrant and Cordell, 2002; Clement and Cheng, 2011). Numerous studies have revealed that understanding the value orientation and attitudes of the general public toward natural resource or forest management had a positive effect on the development and implementation of forest policy (Steel et al., 1994; Shindler and Reed, 1996; O'Leary et al., 2000; Tarrant et al., 2003; Schaaf and Broussard, 2006; Chang et al., 2009; Clement and Cheng, 2011; Eriksson et al., 2013). This understanding of the public's perspective can also help reduce the conflicts between the public and the government and allow the policy to be implemented effectively (Allen et al., 2009; Clement and Cheng, 2011).

Beyond the public's values, factual knowledge is also regarded as an important factor that influences the perceptions of policy (Kangas and Niemelainen, 1996). Due to an extensive range of knowledge on forestry, selecting the corresponding knowledge to obtain objective results is important for predicting people's attitude toward specific policies (Mcfarlane and Boxall, 2000). Natural forests and plantation forests are the two main forest types in Taiwan and have different management targets. Current natural forest management overemphasizes environmental conservation, and the timber harvest has been prohibited since 1991. Plantation forest management has also followed this model, with only a small amount of timber production in recent years. Consequently, most timber products are imported from foreign countries (Lin et al., 2015). The conceptions of natural forest and plantation forest management and the timber production policy are important pieces of knowledge in forestry, particularly in modern Taiwan. However, few studies have addressed the public's knowledge of forestry. Understanding the public's knowledge of forestry can help assess the relationship between the public's expectation and the targets of forest management policies.

The purpose of this study is (1) to compare the forest values of the public in mountain and lowland areas, (2) to assess the public's attitudes toward the RMA and ALA projects, (3) to show the public's knowledge of forest management and timber production, and (4) to predict attitudes toward the RMA and ALA projects based on the public's opinion of forest values and forest knowledge.

2. Material and methods

2.1. Study area

The study site was located in central Taiwan, which contains 5 counties (cities): Miaoli, Nantou, Taichung, Changhua and Yunlin. Because a broad area in central Taiwan has been engaged in the RMA and ALA projects, it is suitable as a study area. We also found many relevant researches here (e.g., Yen et al., 2002; Lee et al., 2003, 2007a,b; Yen et al., 2008). To survey the public's opinions of the RMA and ALA projects, we selected green spaces (i.e., forests areas, lowlands with tree groups and parks) as study sites using on-site surveys with a convenient sampling method via questionnaires. Our main consideration was that members of the public who visited these places might have more interest in the RMA and ALA projects. The survey was conducted from July 2012 to March 2013. Out of a total of 800 questionnaires, 724 valid questionnaires were obtained for a response rate of 90.5%.

2.2. Theoretical framework

We developed the relationship of people's forest value and attitudes toward RMA and ALA projects based on cognitive hierarchical theory as the theoretical framework. This theory stipulates a logical structure and social-psychological theory that can validly present the hierarchical relationships from the foundation of basic values and beliefs (also called value orientation) to the higher layers of specific attitudes and behaviors (Rokeach, 1973; Fulton et al., 1996; Nordlund and Westin, 2011; Eriksson et al., 2013; Czaja et al., 2016). However, the lower layers are more abstract, general and stable which are not easy to track people's experiences and specific situations. On the contrary, the higher layers of cognition are more concrete and easy to change (Fulton et al., 1996; Mcfarlane and Boxall, 2000). The framework used for the present study addressed relationship of the second and third layers of cognitive hierarchical theory—that is, using value orientation to predict attitudes.

Additionally, we found that many studies discussed the relationship between people's value orientation and attitudes also added some factual knowledge. Usually, this finding helps explain people's attitudes (Mcfarlane and Boxall, 2000, 2003; Mcfarlane et al., 2006; Chang et al., 2009; Hajjar and Kozak, 2015). Therefore, some forest-specific knowledge was incorporated in the framework of the present study to predict public's attitudes toward RMA and ALA projects. Fig. 1 displays the study framework.

2.3. Study method

For analysis, from the questionnaire, we extracted main sections that contained (1) forest values, (2) attitudes toward the RMA and ALA projects, (3) forest knowledge, and (4) demographic information. The details are described as follows:

Regarding forest values, we adopted a forest value scale with 13 statements that were developed by Brown and Reed (2000) and were translated into Chinese. This scale has more distinct forest values and has been widely used in measuring the public's landscape values (Brown and Reed, 2000; Brown, 2005; Clement and Cheng, 2011; Sherrouse et al., 2014). Because one of our study purposes was to compare the public's forest values of mountain and lowland area, we used
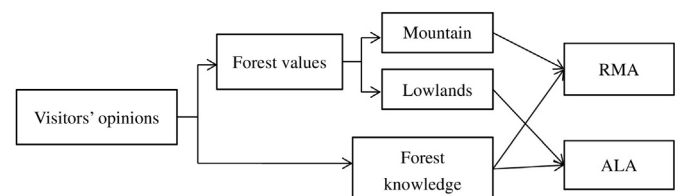
Fig. 1. Study framework.