Identifying the farmer’s intention to adopt sustainable practice in giant panda conservation area

Yan Tang¹, Yiping Gou² and Cuibai Yang*²

¹ Research Center for Eco- Environment Damage, law school, Sichuan University, Chengdu, 610064, China
² Law school, Sichuan University, Chengdu, 610064, China
*Corresponding author’s e-mail:349534845@qq.com

Abstract. The giant panda (Ailuropoda melanoleuca), in China, is under threat from expansion of overgrazing and collecting. Livestock grazing has become a major conservation conflict in A. melanoleuca habitats. Conservation actions are ultimately human behaviours, and it is vital to understand how socio-psychological factors shape human interactions with the environment and choices to conserve biodiversity. Despite the numerous studies focused on giant panda conservation, little work has been done on the socio-psychological behaviours of farmers with respect to giant panda conservation practices. This paper uses the theory of planned behavior (TPB) to identify the psychological factors regarding livestock grazing practices in Chinese panda conservation area. The TPB hypothesizes that the adoption is driven by intention, which is determined by three psychological constructs: attitude, subjective norms, and perceived behavioral control. A survey with 196 farmers was conducted. Result shows that the intention of farmers was mainly influenced by their perceived resource, followed perceived behavioral control, and attitude.

1. Introduction
More than 10 million farmers live in the geographical range of the giant panda (Ailuropoda melanoleuca) [1]. The livelihood of these farmers mainly involves agricultural production activities, such as grazing livestock, collecting forestry products, and planting vegetables [2]. The link between the livelihoods of farmers and biodiversity in the panda habitats is very close (Yang, Dietz, Yang, Zhang, & Liu, 2018). Previous research has indicated that the intentions and behaviours of farmers have important effects on biodiversity conservation [3]. Therefore, it is vital for the conservation professionals to understand the intentions of farmers regarding panda conservation practices [4].

Factors affecting the intentions of farmers to adopt conservation practices have been investigated in many countries and across scientific disciplines [5]. Socio-psychological approaches are typically used to explain the intentions behind conservation conflicts [6]. Previous studies have mainly been focused on the intentions of farmers to implement agricultural practices for conservation [7]. There is only a small body of research on the intentions and behaviours of farmers regarding wildlife conservation [8].

The objectives of the research were twofold. We first determined the attitudes and intentions of farmers towards the conservation practices in the giant panda protected area. Next, we explored the effects of perceived resources, perceived behaviour controls, attitudes, and normative issues on the intentions of farmers regarding giant panda conservation practices.
2. Materials and Methods

2.1 Surveys
This research was conducted in the geographical range of wild giant pandas. The data used in this study were derived from a structured survey of 196 farmers across the geographical range of giant pandas. We randomly sampled adult farmers in the six mountainous regions to obtain a representative sample of the population. The survey was conducted in the form of telephone interviews and on-site field surveys to avoid over-representation of the older population when sampling only among the latter [9]. The target number of responses was set at 200 to achieve an acceptable margin of sampling error of ±5.0% at the 95% confidence level [10].

2.2 Data analysis
In addition to the psychological variables, the characteristics of farmers that influence their intentions to adopt wildlife conservation practices under the payment for ecology-services (PES) policy were also investigated. The variables considered were farmer age, education, traditional culture, and participation in a grazing group and subsidy policy.

The theory of planned behavior (TPB) is among the most common approaches in the field of environmental behavior. In this paper, we used an extended version of the TPB in this study to investigate the intentions of farmers to apply biodiversity conservation practices on the basis of PES policies in the giant panda protected area, from a socio-psychological perspective.

Logistic regression is a popular statistical technique in which the probability of a dichotomous result such as “agree” or “not agree” is related to a set of explanatory variables that are hypothesized to influence the result [11]. Logistic regression was widely used as an analytical tool to investigate the factors influencing adoption.

In this study, the dependent variable was farmer intention to implement wildlife conservation practices following the PES policy. Table 1 provides the intention statements used in our investigation. The intention is divided into two categories with the following responses: 1 = “agree” (positive intention) and 0 = “not agree” (no intention).

Table 1. Investigation of farmers’ intentions.

| Intention                                                                 |        |
|--------------------------------------------------------------------------|--------|
| Do you agree with adopting giant panda conservation practices based on the current PES policy? (agree = 1, not agree = 0) | 1      |
| a. How strong is your intention to reduce grazing livestock? (strong = 1, weak = 0) |        |
| b. How strong is your intention to graze in a defined area? (strong = 1, weak = 0) |        |

3. Results and discussion

3.1 Socioeconomic characteristics of the sample
Table 2 summarizes the socioeconomic characteristics of the full sample of farmers (n = 196). The descriptive results indicated that around 28% of farmers have a junior high school level education or higher. These figures are in line with the giant panda range averages (National Forestry and Grassland Administration, 2015). Furthermore, about 69% of farmers participate in grazing group. Finally, 39% of farmers stated that the PES compensation accounts for more than 20% of the total family avenue.

Table 2. Means and standard deviations of the socioeconomic characteristics of farmers.

| Variable | Description                                                                 | Mean  | SD   |
|----------|-----------------------------------------------------------------------------|-------|------|
| Age      | Age of the farmer (1 = under 35, 2 = between 35 and 45, 3 = between 46 and 55, 4 = between 56 and 65, 5 = above 65) | 3.61  | 1.03 |
| Education| Highest level of education completed by the farmer (1 = above primary school, 0 = otherwise) | 0.28  | 0.50 |
Traditional culture Farmer is a member of the Tibetan, Qiang, or Yi minority (1 = yes, 0 = otherwise) 0.57 0.52
Grazing group Participation of the farmer in a grazing group (1 = yes, 0 = otherwise) 0.69 0.41
Income PES compensation amount as a percentage of total household income is above 20% = 1, or else = 0 0.39 0.51
Policy Participation of the farmer in a subsidy payments for wildlife conservation scheme and/or receipt of a subsidy for wildlife destruction in the last two years (1 = yes, 0 = otherwise) 0.41 0.55

3.2 Factors influencing the intentions of farmers to adopt giant panda conservation practices

Table 3 summarizes the intentions to adopt conservation practices in the full sample. Intentions to reduce grazing are influenced significantly and in a positive manner by perceived resources (1% level), perceived behavior control (5% level), attitude (1% level), subject norm (1% level), traditional culture (1% level), income (1% level), policy (1% level), and the 35–45 and 46–55 age groups at the 1% and 10% levels, respectively. Thus, farmers in these age groups are more likely than those aged 65 and over to have a positive intention to reduce grazing.

Table 3. Results of binary logistic regression to predict the intentions of farmers to adopt conservation practices.

| Variables                  | Coeff  | SD   | Marginal effect | SD   |
|----------------------------|--------|------|-----------------|------|
| Perceived resources        | 0.29***| 0.05 | 0.0326***       | 0.0245|
| Perceived behavior control | 0.19** | 0.10 | 0.0324***       | 0.0352|
| Attitude                   | 0.41***| 0.11 | 0.0157**        | 0.0215|
| Subject norm               | 0.43***| 0.08 | 0.0183**        | 0.0309|
| Agea                       |        |      |                 |      |
| Under 35                   | 0.04   | 0.35 | 0.0717*         | 0.0298|
| 35–45                      | 1.27***| 0.41 | 0.0805***       | 0.0385|
| 46–55                      | 0.46*  | 0.50 | 0.0220**        | 0.0104|
| 56–65                      | 0.43   | 0.25 | 0.0040          | 0.0377|
| Education                  | 0.22   | 0.24 | 0.0390          | 0.0561|
| Traditional culture        | 0.65***| 0.23 | 0.0413**        | 0.0418|
| Grazing group              | 0.24   | 0.30 | 0.0171          | 0.0749|
| Income                     | 0.91***| 0.38 | 0.0505***       | 0.0592|
| Policy                     | 0.80***| 0.27 | 0.0608***       | 0.0381|
| Sample numbers             | 196    |      |                 |      |
| Pseudo R²                  | 0.37   |      |                 |      |
| Prob > χ²                  | 0.0000 |      |                 |      |
| % Correctly classified     | 91.43  |      |                 |      |

Note: Significance at 10% (*), 5% (**), and 1% (***) levels.

a The reference group for age is the group aged 65 and over.

Meanwhile, all of the significant variables also have significant marginal effects. As the level of the psychological variables of perceived resources, PBC, attitude, and subject norm increase by one unit, the probability of a farmer reducing grazing according to the PES policy increases by 3.3%, 3.2%, 1.6%, and 1.8%, respectively. The variables of age 35–45, age 46–55, traditional culture, income, and policy increase the probability of uptake by 8.1%, 2.2%, 4.1%, 5.1%, and 6.1%, respectively.

The results revealed that traditional culture was significantly and positively associated with intention for the non-subsidized conservation participants. The positive influence that traditional culture can have on the adoption of grazing practices is well established [12]. This result is consistent with that of a previous study, in which it was found that farmers who are Tibetan are more likely to adopt practices to conserve grassland.
4. Conclusion
In this study, we examined which psychological and socioeconomic factors affect the intentions of farmers to adopt giant panda conservation practices. Two conclusions can be drawn from this study. (a) First, psychological factors have significant influences on the conservation behaviours of farmers, although PES policies also have positive and significant effects on their intentions. Accordingly, merely providing payments for conservation is not enough to promote sustainable giant panda conservation practices. Instead, attention should also be paid to psychological issues in giant panda conservation plans. (b) Second, the TPB framework appears to explain the intentions of farmers to implement conservation practices in nature reserves sufficiently. Thus, this paper provides valuable reference information and could motivate researchers to apply TPB frameworks in wildlife conservation and farmer livelihood development studies.

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