



Farmers' Assessments of Their Cooperatives in Economic, Social, and Environmental Terms: An Investigation in Fujian, China

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This study is the first to empirically investigate whether farmers' assessment of their cooperatives' environmental efforts is related to their satisfaction with the cooperatives, in addition to their assessment of the cooperatives in economic and social terms. A survey was conducted among a randomly selected sample of 211 members of 63 farmer cooperatives in Fujian Province, China. Binary logit analyses were conducted to test three theoretically derived hypotheses. There was a positive relationship between member satisfaction with the cooperatives and farmers' assessment of the cooperatives' environmental actions, although the cooperatives' economic and social contributions were even more appreciated. Consequently, at least under the prevailing circumstances, member satisfaction with their cooperatives is positively associated with the farmers' view of the environmental ambitions of their cooperatives.

Keywords: ecology, member involvement, member satisfaction, social capital, standard of living, sustainability

INTRODUCTION

Agricultural production has a major impact on the environment. Thus, environmental gains can be expected if farmers choose environmental-friendly production practices, especially if the members of a farmer cooperative support their cooperative's environment protection policy. The present study investigates how farmer members of Chinese cooperatives consider their cooperatives' environmental ambitions in comparison with the economic and social benefits that they get from the cooperatives. Thus, this study comprises environmental, economic, and social sustainability, all of which are specified in the Brundtland Report. The United Nations established this commission (formally "The World Commission on Environment and Development"), which presented its report "Our Common Future" (WCED, 1987).

There is a rich volume of literature about farmers' satisfaction with their cooperatives (Hernández-Espallardo et al., 2013; Arcas-Lario et al., 2014; Grashuis and Cook, 2019). Many researchers have testified to a strong relationship between members' satisfaction with their cooperatives and their view of the economic and social benefits of cooperative membership (Borgen, 2001; Feng and Hendrikse, 2008; Morfi et al., 2015; Morfi et al., 2021). There may, however, also be a relationship between member satisfaction with their cooperatives and their view of the cooperatives' environmental ambitions.

To the best of our knowledge, the present study is the first empirical investigation into whether member satisfaction with cooperatives is related to members' view of their cooperatives' environmental efforts. Only a few previous studies have mentioned that farmers may involve

themselves in cooperatives that strive for environmental protection (Slangen and Polman, 2002; Van Dijk et al., 2016). Because farmers and farmer cooperatives work with biological production, which implies environmental consequences, cooperatives may have an opportunity to reduce the environmental impact of member and cooperative production (Lokhorst et al., 2011; Mills et al., 2017). Chinese agriculture is no exception. Because of intensive production on small lots, one farmer's production affects other farmers and the surrounding community, and there is a risk that the individual farmer cares mainly about his or her own production results while caring less for the community. Hence, an institutional arrangement of cooperatives can be a vehicle for reducing environmental problems (Franks and Emery, 2013; Riley et al., 2018).

Chinese farmer cooperatives have generally small memberships and are village-based units. There are social relationships within an existing membership as the members know each other, communicate and have a common set of norms. Neighboring farmers know that they are mutually dependent on each other. Thus, already existing cooperatives can quite easily extend their present activities to comprise a policy of environmental protection.

The aim of this study is to explore the relationship between Chinese farmer satisfaction with their cooperatives and their perceptions of the cooperatives environmental terms, as opposed to their perception of the cooperatives in economic and social terms. This study extends knowledge about the *raison d'être* of cooperatives beyond the existing literature, which explains the economic and social importance of cooperatives in terms of transaction cost theory, social capital theory, and other theoretical approaches (Fulton, 1995; Holmström, 1999; Valentinov, 2004a, 2007; Cook and Grashuis, 2018). Extended knowledge about cooperative members' views of their cooperatives' environmental work would be valuable when cooperative decision-makers are trying to adapt the cooperatives' activities to the wants of their memberships. Furthermore, such knowledge may be valuable when governments design and implement programs for environmental policies, which are related to agricultural production.

Section **"The Development of Chinese Farmer Cooperatives"** presents the development of farmer cooperatives in China, especially how the cooperatives have expanded their range of activities during recent years. Section **"Conceptual Framework"** offers a conceptual framework that explains possible rationales for agricultural cooperatives. The section thus comprises theoretical arguments for why cooperative members may be motivated by what their cooperatives offer in economic, social, and environmental terms. Section **"Methodology"** presents the methodological issues concerning the choice of variables, data collection techniques, and statistical methods. Section **"Findings"** comprises the findings and interpretations of the findings. Last, Section **"Conclusions"** presents conclusions.

THE DEVELOPMENT OF CHINESE FARMER COOPERATIVES

Farmer Cooperatives in China

Rural reforms at the end of the 20th century in China paved the way for commercialization and marketization in the agri-food

sector, but these reforms did not help farmers gain better prices when selling their products and buying farm inputs. To strengthen primary agriculture, a law on cooperatives was introduced in 2007 ("Farmer Specialized Cooperative Law of the People's Republic of China"). During the relatively few years since the law was passed, farmer cooperatives have come to dominate the Chinese agricultural sector. Nearly half of all Chinese farmers are members of cooperatives. By the end of October 2019, the number of registered farmer cooperatives was 2.2 million. However, perhaps only 20% of registered cooperatives are actually in operation because many people register cooperatives to gain financial support from the government and because local governments want to signal success at a higher political level (Sultan and Wolz, 2012; Deng et al., 2016). The general definition of cooperatives applies to Chinese agricultural cooperatives: "In a cooperative, the user is the focal point, with the direct status of user, owner, and control vested in the same individual" (Dunn, 1988, p. 85). Even though Chinese cooperatives fit into this definition, they are different from cooperatives in most other countries (Bijman and Hu, 2011). The Chinese law on cooperatives states that members can be anyone who in any way contribute to the operations of a cooperative. Thus, members could be farmers who supply agricultural products but invest only small amounts of capital, but also those who provide much financial capital but deliver no or only a small amount of products. The former are called "common members" and the latter "core members" (Xu, 2005; Liang and Hendrikse, 2013). Four-fifths of the members are common members.

Even though the two categories of members are mutually dependent upon each other, they have conflicting interests as it concerns the allocation of revenues as product prices and capital remuneration. Therefore, the law on cooperatives stipulates a limit regarding how much dividend may be paid to investing core members vs. the delivering common members (Liang et al., 2015).

The law allows different principles for the allocation of voting power. While the principle of equal voting is the basic one, members with large production volumes may have up to one-fifth of the total number of votes. In reality, however, most power is in the hands of the core members (Liang et al., 2015). They are not only wealthier but are also better educated than the common members are. They also have better networks with various business partners within the value chains as well as with the local and provincial governments. Nevertheless, the cooperatives operate independently from government interference. The membership is voluntary even though there may be social pressures on the farmers within a village.

Cooperatives and the Environment

While the law on cooperatives was intended to raise the farmers' incomes by giving them more market power, cooperatives have later extended their activities to comprise other services (Liu, 2017). For instance, members receive training and advice on efficiency raising production practices. The cooperatives have also involved themselves in financial services (Yu and Nilsson, 2018, 2019). Stimulated by government, farmer cooperatives process member agricultural products into value-added

products to be sold at higher prices. Thus, there has been a development in terms of not only the number and size of cooperatives but also in new functions.

Another trend is that the cooperatives introduce social issues. Since 2013, the government has stimulated farmer cooperatives to participate in social services within their villages (Sun, 2017). An example is the financial assistance that some cooperatives provide for their poor farmer members and even nonmembers. Some cooperatives also care about vulnerable villagers, such as the elderly and sick, orphans, and persons with disabilities, many of whom are either acquainted with or related to cooperative members.

Likewise, many cooperatives have involved themselves in environmental services beyond what is required by the governmental environmental requirements. This indicates that cooperatives may constitute an institutional arrangement for rural environmental protection that the government cannot accomplish.

The Chinese constitution and various laws and decrees contain regulations on public participation in environmental protection. The law on environmental protection states, "All units and individuals have the obligation to protect the environment and have the right to report and sue units and individuals that pollute and damage the environment." This principle of public participation is an important legal basis for people to participate in environmental protection in China. The environmental protection clause of the Civil Code was passed as legislation in 2020 in response to the call for mandatory environmental protection in a law from 2014. The Civil Code clause constitutes the main legal basis for the farmer cooperatives' involvement in environmental protection.

Environmental policy in China has not met expectations due to an insufficient involvement of the general public. People who have no direct interests are not enthusiastic about environmental affairs (Zhang and Tian, 2021). If individuals feel that their rights are infringed upon, free rider behavior will result, giving rise to a suboptimal outcome for all individuals.

The focus of China's environmental policy has mainly been on pollution prevention and the control of large- and medium-sized cities and industrial enterprises, while less attention has been paid to environmental protection in rural areas. The rise of farmer cooperatives is successively breaking this deadlock. Through technical guidance and services to members, Chinese cooperatives are raising farmers' awareness of safe production and high-quality products. According to Zhao et al. (2016), technical training provided by the cooperatives helps farmers to follow the safety standard. The cooperatives promote the reduced use of chemical inputs and the reuse of waste. Many cooperatives take on organic production, for example, by purchasing environmental-friendly raw materials such as organic fertilizers.

Just as most Chinese citizens are not involved in environmental issues, it is unlikely that farmers will on their own initiative convert from their traditional production practices into more environment-friendly ones. Such a shift is more

probable if it is mediated through a farmer cooperative, where all members have an influence on the decision. If the members know that all other members are obliged to follow a specific set of rules, they are more likely to choose environment-friendly production. People are more willing to accept rules if they have contributed to these rules. The social capital within the small, homogeneous, and geographically limited membership implies a lower risk of shirking. The core members who have invested most money in the production facilities are dependent upon the common members who supply the bulk of the raw products, just as the supplying common members are dependent upon the investing core members. Against this background, it is understandable that an increasing number of Chinese cooperatives have introduced rules for more safe and environmental-friendly production and mechanisms to ensure that members abide by these rules.

CONCEPTUAL FRAMEWORK

The Economic Dimensions of Cooperatives

Economists provide strong theoretical arguments for the view that farmers involve themselves in collective action for economic gains (Ollila, 1994; Hendrikse and Veerman, 2001; Feng and Hendrikse, 2008). This position is also supported by empirical investigations (Ma and Abdulai, 2016; Shumeta and D'Haese, 2016; Mojo et al., 2017; Grashuis and Su, 2019).

A widely accepted theoretical explanation is that farmer cooperatives have the ability to reduce member transaction costs. Without cooperatives, farmers would have difficulties in dealing with powerful business partners (Valentinov, 2007). Because noncooperative business firms are typically superior to the farmers in terms of knowledge, financial status, and other resources, they are in a position to deceive farmers. Many agricultural products are perishable, which means that external buyers may use a hold-up strategy that results in unduly poor conditions for the farmers.

Other researchers present other economic arguments for cooperatives (Schrader, 1989; Van Dijk, 1997). Cooperative members can reach large and lucrative markets, and they are able to build a brand name, which results in higher sales prices. A cooperative can coordinate member production, resulting in higher and more even product quality. Yu and Nilsson (2019) have found that Chinese cooperatives may support member efforts to acquire capital for investments in their agricultural operations. The social character of cooperative societies entails many members and large volumes, and consequently, the cooperatives can enjoy economies of scale (Nilsson, 1998).

Many Western cooperatives have followed a low-cost strategy achieved through waves of mergers. As they have become large, their memberships have become sizeable and heterogeneous, and the business activities have become complex. This has threatened member involvement (Nilsson, 2018). Few Chinese cooperatives have followed a similar strategy concerning large-scale

operations. They are small and locally operated, and consequently, the general arguments for farmer cooperatives are likely to apply. This leads to the following hypothesis:

Hypothesis 1: There is a positive relationship between Chinese farmer satisfaction with their cooperatives and the member perception that the cooperatives contribute to a higher standard of living.

The Social Dimension of Cooperatives

To explain the existence of cooperatives, it is necessary to consider not only economic factors but also the social relations between the farmers. A cooperative exists because a group of farmers thinks that a cooperative could benefit them. Thus, it matters how the farmers assess the cooperative business form and that assessment depends on the social context. Most often, local farmers know each other, communicate, and have confidence in each other. Without social interaction, a group of farmers would not run a jointly owned cooperative. One may even claim that the existence of social capital within a cooperative membership is the basis for the cooperative building up financial capital (Valentinov, 2004a, b; Yu and Nilsson, 2018, 2019).

Many previous studies indicate that social factors are related to cooperative member satisfaction (Borgen, 2001; Hansen et al., 2002; Nilsson et al., 2009; Morfi et al., 2021). Communication, social interaction, and collaboration within a cooperative membership positively affect members' views of their cooperative's business activities.

The social relationship between members and cooperatives is dual. One can distinguish between what the cooperative does for its members and what the members do for their cooperative. First, a cooperative contributes to creating cohesion, safety, and stability within the membership (Yu and Nilsson, 2019); the existence of a cooperative affects the mentality within the community of farmer members. Second, the members contribute by participating in the governance of their cooperative; they inform themselves, take part in meetings, and discuss about investments (Morfi et al., 2021). These two aspects of social capital are interdependent but equally important. This leads to the second hypothesis:

Hypothesis 2: There is a positive relationship between Chinese farmer satisfaction with their cooperatives and the member perception that the cooperatives contribute to their social life.

The Environmental Dimension of Cooperatives

Environmental protection often has a public goods character. People may interfere with some collective interests when they act in their individual interests. This phenomenon is often termed "the tragedy of the commons." In such situations, there is a need for collective action, which requires an institutional arrangement to harmonize the incentives of the individuals. According to Ostrom (1990) and Ostrom (1999), the solution to "the tragedy of the commons" is an institutional setting, in which the group of individuals agree upon a set of norms that regulates the negative impact of individual activities (Termeer et al., 2013). A

cooperative can provide such an institutional setting for aligning member incentives for producing more in line with environmental requirements. There are no general principles for how such alignments can be achieved, but many empirical studies present various design parameters for the coordination of action within a heterogeneous group of cooperative members (Iliopoulos and Theodorakopoulou, 2015; Tschopp et al., 2018; Dary and Grashuis, 2021).

While few previous studies have been concerned with the farmer view of cooperatives as a tool for environmental protection, there is much research on farmer motivation for environmental practices in their own agricultural operations (Lokhorst et al., 2011; Lokhorst et al., 2014; Mills et al., 2017). This research indicates that many farmers reduce the use of chemicals on their own initiative. Care for the environment may fit a farmer's self-identity and is often related to social norms (Van Dijk et al., 2016).

However, the environmental actions of individual farmers have only moderate effects because each farmer's acreage is smaller than the habitats of many species of wild animals and plants, and small fields increase the risk for the leakage of pesticides, weeds, polluted water, etc. Therefore, better environmental protection is achieved if several neighboring farmers take part in environmental programs (Emery and Franks, 2012; McKenzie et al., 2013). This objective can be attained with the help of local cooperatives where the members live close to one another.

Cooperative member democracy may be effective in coordinating member incentives to conduct environment-friendly production (Morfi et al., 2015; Yu and Nilsson, 2018). With the help of its financial and social capital, a cooperative can include environmental issues beyond the marketing of member products, the sales of farm inputs to members or other tasks. Fahlbeck and Nilsson (2002) have presented an example where an existing cooperative established a new line of organic dairy products after a group of farmers convinced fellow members to do so.

A cooperative could orient itself toward environmental production for economic reasons. The farmers may realize that the excessive use of chemicals is unnecessarily costly, and it may harm the long-term fertility of the soil to the detriment of future generations. Moreover, if there is a strong demand for environment-friendly products, a higher price may outweigh the higher cost of environmental production.

In some European countries, governments have contracts with cooperatives, whereby the farmers receive remuneration for specific protection measures. Nevertheless, the environmental work is often driven by farmer idealism and their connection to nature (Lokhorst et al., 2011). This is also true in China; some cooperatives receive financial support for environment-friendly production. In recent years, the environmental protection awareness of Chinese farmers has increased, especially after the publicity of China's green policy. Yu and Huang (2020) have demonstrated that Chinese cooperatives also provide noneconomic benefits to their members. Cooperatives strengthen their members in social and environmental respects. Cooperatives pay attention to a

TABLE 1 | Dependent and independent variables and descriptive statistics for the models.

Variable	Symbol	Measurement and evaluation	Mean	Std. Dev.	Min	Max
Dependent variable	Y	After joining the cooperative, I became more satisfied with my life. (1 = yes; 0 = no)	0.787	0.411	0	1
Economic dimension	EC	(1) Joining the cooperative has improved my standard of living. ^a	3.976	0.573	2	5
Social dimension	SO ₁	(2) After joining the cooperative, I communicate more with other villagers. ^a	3.981	0.617	2	5
	SO ₂	(3) After joining the cooperative, I know more about democracy and unity. ^a	3.953	0.646	2	5
Environmental dimension	EN ₁	(4) My cooperative plays an obvious role in promoting the improvement of the local environment such as soil protection. ^a	4.009	0.851	2	5
	EN ₂	(5) After joining the cooperative, I have adopted pro-environment production practices. ^b	3.806	0.876	1	5
Control variables	X ₁	(6) What is the equity capital of your cooperative? (10 thousands of yuan)	480.418	563.162	10	4.180
	X ₂	(7) What was your cooperative's sales volume (million yuan) last year? (1 = no more than 100; 2 = 100–500; 3 = 500–1,000; 4 = 1,000–5,000; and 5 = more than 5,000)	2.602	1.408	1.000	5.000
	X ₃	(8) What is your educational level? (1 = college or above; 2 = senior high school or similar; 3 = junior high school; and 4 = primary school or below)	2.237	0.947	1.000	4.000
	X ₄	(9) What is your age? (years)	50.085	9.596	25.000	70.000

^aThe options for questions (1) to (4) are as follows: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree.

^bThe pro-environmental behaviors include the following five practice: organic fertilizer application technology, straw returning technology, green prevention and control of crop diseases and insect pests, less times of spraying pesticides in the same scale planting than in the past, and production of organic fertilizer from livestock manure. The options for question (5) are as follows: 1 = none of the above pro-environmental behaviors are selected, 2 = one of the above options is selected, 3 = two of the above options are selected, 4 = three of the above options are selected, and 5 = four or five of the above options are selected.

sustainable and balanced development of the economic and noneconomic interests of their members. On the other hand, Zhou et al. (2018) have reported that Chinese cooperatives recommend their members to use more chemical fertilizers and more pesticides, both of which may harm the environment, and consequently, members with large social networks will use more chemical inputs. Abebaw and Haile (2013) have reached a similar conclusion in a study of Ethiopian smallholders. These findings pertain to agriculture in less developed regions where cooperatives have the task of promoting farmers' economy.

Even though the references above provide partly contradictory findings, the overall tendency is that cooperatives may act to protect the environment. This leads to the third hypothesis:

Hypothesis 3: There is a positive relationship between Chinese farmer satisfaction with their cooperatives and their perception that the cooperatives contribute to alleviating environmental problems.

METHODOLOGY

Variables

To explore the relationship between members' satisfaction with their cooperatives and their assessment of them in economic, social, and environmental terms, data were collected through personal interviews with members of farmer cooperatives in Fujian Province. This province is located on the coast of the East China Sea and is one of the most developed provinces in China. Fujian Province has almost 40 million inhabitants, and it covers 124,000 km² of which 80% is mountainous and hilly.

Before the survey, the research team worked out a question guide for the dependent and independent variables. The dependent variable was farmer satisfaction with their cooperative. The respondents were asked to state whether their

membership in the cooperative had made them more or less satisfied or contented, using the Chinese expression for "happy." The operationalization of this variable is shown as Y in **Table 1**.

The independent variables represent farmer views of their cooperatives in economic, social, and environmental terms. Each dimension was operationalized into one or two questions in a questionnaire. Yu and Nilsson (2018) and Feng et al. (2016) have influenced the measurements used. **Table 1** shows how the variables were measured.

The economic dimension: One question in the questionnaire concerned the respondents' opinion about whether the cooperatives improved their standard of living (EC in **Table 1**).

The social dimension: Two questions in the questionnaire represented the social dimension. One asked what the cooperative meant to members (SO₁) and the other one asked what the members did for their cooperative in terms of member democracy (SO₂).

The environmental dimension: The environmental ambitions of a cooperative may be seen at two levels: what the farmers think about the environmental work and whether they consider themselves as following the rules. Thus, in **Table 1**, EN₁ shows the question about the farmer member view concerning whether their cooperatives strive for environmental progress, and EN₂ represents whether farmers consider themselves as having adopted the cooperatives' pro-environmental production practices.

Control variables: Four control variables were selected (**Table 1**). Variable X₁ and X₂ represent two crucial attributes of the cooperative, namely, the cooperative's total amount of equity capital and its total sales volume, respectively. These factors have been demonstrated in previous research to be related to the members' perception of their cooperative (Huang et al., 2013; Yu and Nilsson, 2018; Yu and Huang, 2020). Other control variables are educational level, X₃, and age, X₄, both of which have been demonstrated to be related

TABLE 2 | Parameter estimates for the binary logit models for farmer's satisfaction and assessment of cooperative functions.

Variable		Model 1		Model 2		Model 3		Model 4	
		Coef	Std. Err	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err
Standard of living	EC	2.133***	0.56	2.140***	0.554	2.177***	0.532	2.249***	0.521
Social communication	SO ₁	3.032***	0.758	3.024***	0.753	2.791***	0.704	2.879***	0.685
Democracy and unity	SO ₂	0.971*	0.568	0.983*	0.556	0.845*	0.501	0.866*	0.501
Environmental improvement	EN ₁	0.789*	0.477	0.811*	0.416	0.799**	0.402	0.813**	0.396
Pro-environmental production	EN ₂	0.033	0.347	/	/	/	/	/	/
Cooperative's equity capital	X ₁	0.00214*	0.00113	0.00215*	0.00113	0.00208*	0.00107	0.00219**	0.00106
Cooperative's sales volume	X ₂	0.164	0.247	0.164	0.247	0.122	0.241	/	/
Educational level	X ₃	-0.141	0.355	-0.143	0.355	/	/	/	/
Age	X ₄	0.0482	0.0313	0.0483	0.0313	/	/	/	/
	CON	-28.31***	5.183	-28.32***	5.183	-24.79***	4.205	-25.31***	4.151
Chi-square		117.960		117.950		115.300		115.030	
Log likelihood		-50.371		-50.376		-51.702		-51.835	
Pseudo R ²		0.539		0.539		0.527		0.526	
Percentage correct (%)		92.420		92.420		91.470		91.470	

***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively; "/" indicates that the variable is not included in this model.

to members' satisfaction with their cooperatives in many other studies.

Case Study Area and Field Survey

Farmer cooperatives in China aim to provide benefits to farmers through services that encourage the adoption of new agricultural technologies, sustain farming practices, and market agricultural products (Ma et al., 2018). This is also true for Fujian Province. Fujian's forest coverage rate is as high as 66.80%, ranking first in China for 40 consecutive years. In 2016, the State Council issued the implementation plan for the National Ecological Civilization Experimental Zone (Fujian), which identified Fujian as the first National Ecological Civilization Experimental Zone in China, exploring experience and providing demonstration for the national ecological civilization system construction. According to the statistics of the agricultural department, by the end of 2018, Fujian had taken the lead in advocating that tea plantations should not use chemical pesticides. Compared with 2016, the use of chemical fertilizers and pesticides decreased by 9.1 and 10.3%, respectively, and the comprehensive utilization rate of livestock and poultry manure was 80%. The green development of agriculture achieved a new breakthrough. Farmers' cooperatives in Fujian not only serve as a channel to help farmers or the rural poor enlarge or improve operations, financing assistance etc., to increase farmers' income and enhance their welfare but also play an active role in guiding farmers to adopt pro-environment production technology, thus promoting the development of green agriculture production. Personal interviews were conducted with 211 members of 63 cooperatives in Fujian Province, all of them having operations. The data collection took place in the period from July 2019 to July 2020. The sampling was conducted in three stages to identify the respondents: geographical locations, cooperatives, and individuals. First, five prefecture-level cities were selected on the basis of their geographical location (Xiameng, Ningde, Putian, Sanming, and Longyan). Second, a number of cooperatives were selected from among the 28 cooperatives in the eastern part of Fujian Province and the 37 in the western part. A few were excluded because they had members who did not

participate in agricultural production. Thus, 63 cooperatives were selected, of which 53 (84%) were fruit and vegetable cooperatives and 10 (16%) were aquaculture and livestock cooperatives. These figures are close to 82 and 18%, respectively, of that which the agricultural department of the provincial government reported for all cooperatives who have participated in agricultural production in the province since 2017.

In the third stage of the sampling procedure, two to six members were randomly selected from each cooperative, resulting in 211 respondents, of whom 66 were core members and 145 were common members. To make the sample more representative, both chairpersons and other members were interviewed. The research team got in touch with the directors of the cooperatives based on the contact information provided by the government's local agricultural departments. The directors were asked to provide contact information for about 5% of its members, and the research team interviewed those members, although some members refused to be interviewed.

It appeared that the sample has a similar spread in terms of geographical distribution, production orientation, and membership type. As shown in Table 1, the average age of the respondents was approximately 50 years. About two-thirds (68%) of the respondents had an educational level equivalent to having completed junior high school. On an average, the respondents owned shares in their cooperatives to an amount of 4,800,000 yuan. Close to two-thirds of the respondents (61%) received an income from the cooperatives that was less than 5 million yuan per year, which indicates that most of them were small-scale producers (100 yuan is 15 U.S. dollars or 12.80 euro).

The Logit Model

The data were analyzed using logit regression. It has been widely used in studies on cooperatives (Guo et al., 2011; Yu, 2012; Kontogeorgos et al., 2014; Feng et al., 2016). A logistic regression model is specifically designed to analyze the relationship between the binary dependent variable and a set of explanatory variables (Stock and Watson, 2014). In this study, the explanatory variables were designed according to economic,

TABLE 3 | Average marginal effects of variables in logit Models 1 and 4 of member satisfaction.

Variable		Marginal effect in Model 1		Marginal effect in Model 4	
		dy/dx	Std. Err	dy/dx	Std. Err
Standard of living	EC	0.154***	0.033	0.166***	0.030
Social communication	SO ₁	0.219***	0.045	0.213***	0.040
Democracy and unity	SO ₂	0.070*	0.041	0.064*	0.036
Environmental improvement	EN ₁	0.057*	0.034	0.060**	0.028
Pro-environmental production	EN ₂	0.002	0.025	–	–
Cooperative's equity capital	X ₁	0.000*	0.000	0.0001**	0.000
Cooperative's sales volume	X ₂	0.012	0.018	–	–
Educational level	X ₃	–0.010	0.026	–	–
Age	X ₄	0.003	0.002	–	–

***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

social, and environmental features. The binary logit models pertaining to the hypotheses are

$$\text{logit}(p_i) = \log\left[\frac{p_i}{1-p_i}\right] = \alpha_i + \beta_i EC_i + \gamma_{ij} SO_j + \delta_{im} EN_m + \theta_{ik} X_k + \varepsilon_i, \quad (1)$$

where p_i is the likelihood of member satisfaction, $p_i = P(Y_i = 1)$; EC_i represents the economic function independent variable; SO_j represents the social function independent variable $j(j = 1, 2)$; EN_m represents the environmental function independent variable $em(m = 1,2)$; and X_k represents the other independent variable $k(k = 1, \dots, 4)$.

To assess the effects of explanatory variables on the probability of member satisfaction, marginal effects were calculated as the amount of change in the probability of satisfaction as a result of one unit change in a continuous explanatory variable (or a change from “0” to “1” in a dummy variable) while holding all other explanatory variables at their means (Washington et al., 2020).

$$ME(x_i) = d\left(\frac{e^{\beta x_i}}{1 + e^{\beta x_i}}\right) / dx_i, \quad (2)$$

where $ME(x_i)$ is the marginal effect of the variable x_i .

FINDINGS

Statistical Analyses

Table 2 presents the parameter estimates and presents a summary of the effect of each predictor. All hypotheses were supported by the data to some degree.

The binary logit model cannot directly reflect the degree of influence like the general regression method. It is necessary to also use the marginal effect regression based on binary logit regression to investigate the degree of the influence of the functions of cooperatives on member satisfaction. Table 3 reflect the average marginal effects.

In order to test whether the above model results were robust, we used the dependent variable w (Are you satisfied with the service provided by the cooperative? 1 = yes; no = 0). The results are shown in Table 4.

Economic Dimension of Member Satisfaction

Table 2 shows a positive and strongly significant relationship between member satisfaction with their cooperatives and member assessment of their living standard. This finding supports Hypothesis 1: *The more the farmers felt satisfaction after joining their cooperatives the more they perceive that the cooperatives contribute to a higher standard of living.* The regression in Table 4 also supports this finding. According to the marginal effects in Table 3, members with a better economy had a 16.6% higher probability of satisfaction.

This finding is in accordance with what could be expected from a theoretical point of view (Ollila, 1994; Hendrikse and Veerman, 2001; Feng and Hendrikse, 2008). Small-scale farmers receive economic benefits through cooperative activities (Feng et al., 2016). The findings are also in line with empirical studies with a focus on the income levels and memberships of smallholders in Mesoamerica (Hellin et al., 2009), Ethiopia (Bernard and Spielman, 2009), China (Ito et al., 2012; Jia et al., 2012; Ma and Abdulai, 2016), and Ruanda (Verhofstadt and Maertens, 2014).

In addition, in the past few years, Chinese farmer cooperatives have become an important way for farmers to get out of poverty. In our field investigation, many farmers said that due to the cooperatives, their income has been greatly improved, and they are satisfied and grateful for the help from the cooperatives.

TABLE 4 | Balance test.

Variable		Coef.	Std. Err
Standard of living	EC	0.726*	0.394
Social communication	SO ₁	0.977*	0.534
Democracy and unity	SO ₂	0.615	0.530
Environmental improvement	EN	1.204***	0.401
Cooperative's equity capital	X ₃	0.001*	0.001
	CON	–11.964***	2.752
Chi-square		56.44	
Log likelihood		–59.837	
Pseudo R ²		0.3205	

***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

Social Dimension of Member Satisfaction

As shown in **Table 4**, the coefficients of SO_1 were significant in all models even at the 1% level, that is, social communication predicted member satisfaction in all models. The other social variable, SO_2 , was positively related to satisfaction in all models at the 10% level. The alternative satisfaction regression in **Table 4** presents almost the same finding. The results in **Table 3** also show that members with an enhanced social embeddedness had a 21.3% higher probability of being more satisfied with the cooperatives. Members who raise the awareness of democracy and unity have a 6.4% higher probability of being satisfied with their cooperative. According to our statistics, the percentage (95.2%) of farmers who confirm satisfaction showed a SO_1 level of between 4 and 5, whereas only 37.4% of the farmers who are not satisfied showed a SO_1 level of between 4 and 5. The distribution of SO_2 shows a similar pattern: 92.8% of the farmers who were satisfied chose a level of SO_2 between 4 and 5, while only 44.4% of the farmer in the other group chose a level of SO_2 between 4 and 5. Hypothesis 2 is supported overall: *There is a positive relationship between Chinese farmer satisfaction with their cooperatives and the member perception that the cooperatives contribute to their social life.*

This finding can be viewed in light of the development in the Chinese countryside. The traditional rural social networks and rural community are threatened by the outflow of the rural population. Farmers are forced into the market economy and urban multiculturalism. Cooperative participation generates social trust, but it also makes members focus on commitment. (Valentinov, 2004a, b; Nilsson et al., 2009; Yu and Nilsson, 2019). Diener and Biswas-Diener (2002) suggest that social connections make poor people more satisfied with life, while higher incomes do not always mean more satisfaction. After joining a cooperative, members communicate more with others, which is conducive to getting useful production technology while also reducing loneliness, relieving anxiety, and otherwise improving social conditions. Moreover, many farmers have increased their sense of democracy and unity, which is positively related to their satisfaction.

Environmental Dimension of Member Satisfaction

In all models, there is a significantly positive relationship between the member assessments of a cooperative's environmental work and their satisfaction with their cooperative (**Tables 2–4**). In the alternative regression in **Table 4**, the cooperative's environmental dimension positively correlates with member satisfaction with their cooperatives. This finding partly supports Hypothesis 3: *There is a positive relationship between Chinese farmer satisfaction with their cooperatives and their perception that the cooperatives contribute to alleviating environmental problems.* According to the marginal effects in **Table 3**, members who feel that their cooperative plays an important role in environmental improvement such as soil amelioration have a 6% higher probability of satisfaction.

The other environment variable (EN_2) shows no significant relation with members' satisfaction. Nevertheless, the

cooperative may promote members' pro-environmental behavior because in a longer time perspective, more members may be willing to abide to the cooperatives' guidelines, which also tend to become stricter because of the government's increasingly high requirements for environmental protection (Yuan et al., 2020).

Some previous studies have found that the existence of cooperatives is negatively related to various agricultural practices, among them the use of chemicals (Abebeaw and Haile, 2013). In line with Ma et al. (2018), cooperatives may improve smallholder agricultural performance through services that enhance the adoption of new agricultural technologies and sustainable farm practices, which include pro-environment production practices.

CONCLUSIONS

This study is based on data collected in 2019 and 2020 through personal interviews with a randomly selected sample of 211 members of 63 cooperatives in Fujian Province of China. The findings indicate that member satisfaction with their cooperatives is related not only to member assessments of their cooperatives' provision of economic and social benefits but also to their perception of their cooperatives' environmental work.

To check the validity of this relationship further, we ran a logit model for selection equation through a dependent variable of satisfaction with the cooperatives' services and independent variables in economic, social, and environmental dimensions. The regressions showed that the variables were significant, suggesting high validity of the results.

While previous studies have concluded that smallholders appreciate their cooperatives in economic and social terms, this study is the first to identify a positive relationship between the environmental performance of the cooperatives and member satisfaction with their cooperatives. Consequently, this study indicates that at least under certain circumstances, the environmental actions of cooperatives may be related to member satisfaction with their cooperatives.

There is no basis to tell whether the findings are representative for other regions of China or elsewhere, neither to tell whether the findings will persist nor change over time. It is, however, not likely that the members' view of their cooperatives' environmental policies will become much different because the policies are decided upon by the members themselves. Because of the social capital within the membership, it is not likely that one member category will challenge another member category by introducing very different environmental rules.

The study had some limitations. One caveat is that the respondents may have had limited knowledge about the actual environmental performance of their cooperatives. There might be a membership norm that the environmental protection should be regarded positively. Moreover, the respondents might have answered positively because they were positive to their cooperatives in economic and social terms. It is

understandable that the respondents are positive to environmental actions if these lead to economic benefits. It is possible that the cooperatives have not taken much environmental action, but that leadership has talked about it, and the leadership wants to communicate about environmental efforts in positive terms.

Even though farmer cooperatives can play a role in environmental protection, their contribution is limited. Cooperatives cannot solve environmental problems beyond their operational area and outside member agricultural practices. Other institutional arrangements are necessary to solve other problems, primarily governmental ones. Cooperatives may help governments to implement environmental policies. Similar to the European experience, the government could provide financial support to cooperatives and their members to protect the environment. Many European farmers are positive toward governmental support for environmental protection.

Furthermore, agricultural cooperatives with a pro-environmental policy may have a pilot and demonstration effect, thereby stimulating others to take up the challenge. One condition for this to happen is that the cooperatives have both good financial records and satisfied members. Another condition is information dissemination about these facts and the cooperatives' planting and breeding modes, possibly mediated by government. If other cooperatives follow suit, there is a chance for rising consumer awareness and the development of less costly inputs, whereby more environmentally friendly farming practices may evolve in China.

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DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants, in accordance with the local legislation and institutional requirements. The participants provided their informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LY: conceptualization, data collection, wrote background, data description, methodology, and explanation of results. JN: concept development, analysis, writing, reviewing, and editing. Both authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The handling editor declared a shared affiliation with one of the authors JN at time of review.

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