

Article

Identification of Non-Economic Influencing Factors Affecting Farmer's Participation in the Paddy Land-to-Dry Land Program in Chicheng County, China

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Abstract: There is global enthusiasm for payments for ecosystem services (PES) programs to solve environmental problems, including in China. However, PES programs in China go against the principle of ‘voluntary transaction’, which weakens the influences of economic factors on farmers’ participation decisions and makes it hard to reveal their influence on farmers’ participation willingness. Using household survey data and a logistic regression model, this study attempts to understand the influencing factors of farmers’ decision-making on involvement in PES projects for hypothetical voluntary participation and focuses on whether the farmer would reject the program if the payment stopped. A surprising but promising result is found in the case of the Paddy Land-to-Dry Land (PLDL) program in Chicheng County, China, wherein, apart from the negative impact of education and the positive effect of off-farm income, two non-economic factors play a significant role in farmers’ participation. The one is basic cognition, which negatively affects farmers’ participation, and the other is inner altruistic motivation, which positively contributes to the participation. In addition, the high proportion of reconversion to paddy land after the payment period threatens the long-term sustainability of the PLDL program. Faced with the low education and environmental cognition statuses in remote agricultural areas, increasing educational quality and promoting the popular awareness of PES programs in rural areas should be highlighted in sustaining the efficiency and effectiveness of PES programs in the long run.

Keywords: Payments for Ecosystem Services (PES); Paddy Land-to-Dry Land (PLDL) program; voluntary participation; non-economic factors

1. Introduction

Since the 1950s, the global ecosystem has changed more dramatically than ever, and the consequent degradation of ecosystem services could worsen considerably during the first half of this century [1]. Payments for ecosystem services (PES) is a possible approach to prevent this degradation tendency with several advantages, including promoting the orderly flow of ecosystem services, translating non-market environmental values into real financial incentives for local actors [2], bridging the interests of landowners and outside beneficiaries [3], and creatively facilitating the integration of protection and socioeconomic development [4–6].

The extent (spatial scale) and depth (time span) of participation in PES programs is critical for its success [7]. When we consider the stakeholders who provide ecosystem services in PES programs, they are usually located in rural area [8–10]. Pagiola et al. [11] divide the factors affecting farmers' participation in PES programs into three groups: eligibility, desirability, and ability, with passive or active characteristics. A more popular classification is to group factors affecting farmers' participation into economic, demographic, and some other non-economic factors [12].

Economic and demographic factors have been proved to play a significant role in farmers' participation in PES programs across various places, targets, and programs, whether it is China's Grain for Green Project or the Australian biodiversity conservation program and no matter whether it is for poverty alleviation or environmental improvement. Economic factors generally focus on PES payments, gross income, and the change probability of on-farm and off-farm income, and demographic variables usually concentrate on age, education level, and gender [13–15]. Nonetheless, an increasing number of scholars have been realizing the remarkable influence of the other non-economic factors on participation in PES programs, which sometimes surpasses demographic and economic causes [13]. Information and communication [16–18], social norms and trust [8,19], altruism [20], and environmental considerations [21,22] are gradually emerging. In particular, four categories of non-economic factors are commonly focused on; psychological aspects, relationships between humans and society, relationships between humans and nature, and the PES program itself.

A key premise of the study of the factors affecting farmers' participation in PES programs is 'voluntary transaction' [6], which means each stakeholder in the program could freely make a choice of whether to buy or to sell ecosystem services. Voluntary transaction is especially important for providers of ecosystem services, as their livelihoods may be impacted by PES programs. What's more, voluntary transaction brings Pareto efficiency [23], which means an ideal state of resource allocation that makes at least one person better if it does not make anybody worse. However, some PES programs remain officially against the 'voluntary' principle [24–26], such as those in China; participants involved in PES programs are mostly limited to central and local governments, while locals are frequently excluded [27]. In this way, rural households are deprived of the right to independent decision-making and the opportunity of trade-off. Voluntary transaction and the autonomous decision-making of farmers are important for the equity, efficiency, and sustainability of PES programs from the perspective of long-term practical needs and theory development, as voluntary transactions could make the implementation of PES programs a market behavior and is likely to introduce market theory to regulate the market behavior and coordinate stakeholders in the transaction, which aids theory development. However, involuntary backgrounds disturb the influence on participation willingness. Thus, some assumed voluntary scenarios should be built to interpret the influencing factors in designing and implementing PES programs under such national conditions [28,29].

The Paddy Land-to-Dry Land (PLDL) program in China, which spans the Miyun Reservoir Watershed, is aimed at relieving Beijing's water crisis [30]. As this program is led by the local government, an interesting question emerges as to what the farmers' real willingness is [31,32] and which factors apart from payments affect that willingness to support PES programs and participation in PES programs [18,19]. Especially when some factors are of low status, such as low educational levels in the villages, would the factors affecting farmers' participation in the PLDL program be the same as those in Western PES programs' surveys? Would the farmer choose to be a rational man, as found and hypothesized by Adam Smith in *The Wealth of Nations* in 1776, whose only target is to maximize his economic interests, or would there be other factors we could not expect to impact the participation? With these questions, we set two scenarios in which the payment is either ongoing or over and obtain the intention of farmers to voluntarily participate in the PLDL program. Based on a logistic model, the influencing factors have been identified and the mechanism has been discussed.

2. Study Area

Located north of Beijing (Figure 1) and spanning 188 km², the Miyun Reservoir is the biggest artificial lake in Asia, with a storage capacity of 43.17×10^8 m³. It is the principal source of surface water for Beijing City, the capital of China, with 80 percent of the watershed situated in Hebei Province and the rest in Beijing City. The storage capacity of the Miyun Reservoir has been decreasing continually since 1999, mainly owing to drought and the massive agricultural consumption of water in upstream areas [33]. Early in 2001, the governments of Beijing City and Hebei Province opted to cooperate in their use of the water resource, and the inter-provincial PLDL program was officially launched on 11 October 2006. By May 2007, 6867 ha of paddy land in the upstream of Miyun Reservoir had been transformed into dry land. As compensation, the Beijing government provides participants of the PLDL program with a yearly payment of RMB 8250 (USD 1188.76, at a conversion rate of USD 1 = RMB 6.94 at 2008) per hectare (the amount was RMB 6750 namely USD 972.62 per hectare before 2008). Moreover, dry land is used for corn planting and could harvest RMB 9000 to 15,000 (USD 1296.83 to 2161.38) per hectare. Adding the payments, the total income could achieve RMB 17,250 to 23,250 (USD 2485.59 to 3350.14) per hectare. Without the PLDL program, farmers could earn RMB 18,000 to 30,000 (USD 2593.66 to 4322.77) per hectare from rice planting now and would get more because of the rising price of rice. Thus farmers did not feel a big income change when the PLDL program started in 2007. However, they are increasingly aware of the loss of income because rice prices are getting higher and higher, but the price of corn remains almost unchanged in recent years.

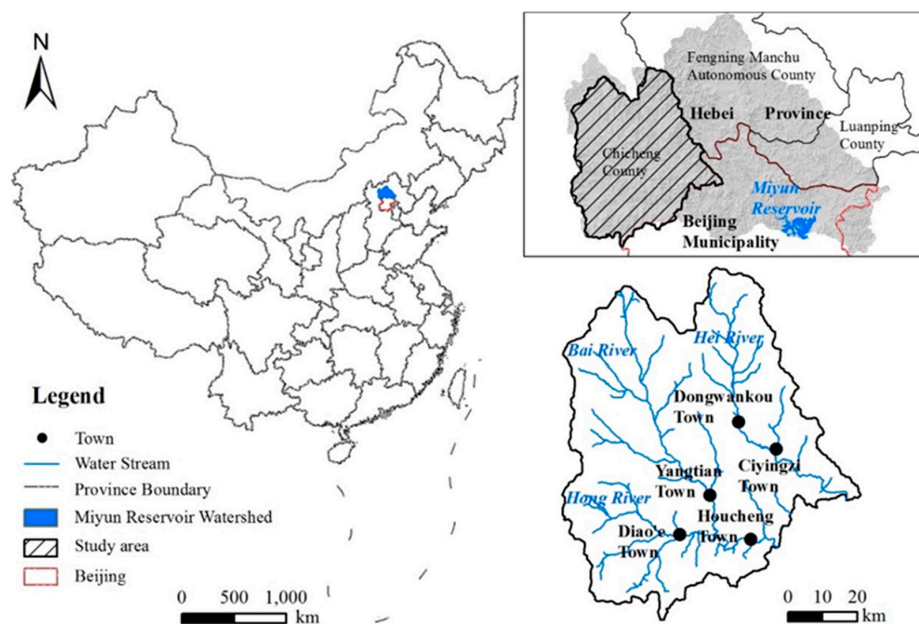


Figure 1. Miyun Reservoir, Chicheng County, and surveyed townships.

Chicheng County is located in northwest Hebei Province, adjacent to northwest Beijing City (Figure 1). The Hei, Bai, and Hong Rivers originate in and run through the county from north to south and drain into the Baihepu Reservoir and the Miyun Reservoir. On average, the three rivers deposit 3.52×10^8 m³ of water in the reservoirs, which occupies 100 percent of Baihepu Reservoir capacity and 30 percent of Miyun Reservoir capacity every year. Since Chicheng County plays a significant ecological role in guaranteeing Beijing's water supplies, not surprisingly, the county has carried out more than seven projects designed to protect water resources. In the PLDL program initiated in 2006, 1160 ha of paddy land located in Dongwankou Town, Ciyingzi Town, and Dongmao Town belonging to the Hei River watershed formed the pilot area. In May 2007, 973 ha of the paddy land of Yangtian Town and Houcheng Town (the Bai River watershed) and Diao'e Town (the Hong River watershed) were

involved in the PLDL program. The process of farmers being included in the program is a compulsory administrative action without negotiation, with the village head conveying the mandate and farmers obeying it. There are now six townships with 2133 ha of paddy land included in the PLDL program, with not even 1 ha of paddy land left in Chicheng County. The project area in Chicheng County receives annual payments from the Beijing government of 17.6 million yuan (USD 2.54 million). The agreement is signed every year.

Chicheng County is classified as poverty-stricken by the State Council. In particular, the people enrolled in the PLDL program are almost an entirely agricultural population, and both their planting patterns and livelihoods have changed profoundly. Since the stakeholders' attitudes and the post-program land use behavior are critical for the program's efficiency and long-term sustainability, it is necessary to hypothesize a situation of free decision-making and to explore what influences the decision.

3. Methods

3.1. Evaluation Framework of Participation Willingness

In the face of the enforced background in some PES programs, scholars have created a post-program situation in which they assume the PES program has ended and farmers are allowed to deal autonomously with their land involved in the programs [34,35]. We have referred to this autonomous assumption to explore the participation willingness in the PLDL program. Assuming voluntary participation, we have constructed a framework (Figure 2) to trace the process of participation in the PES programs with the demographic, economic, and non-economic factors involved.

As Figure 2 shows, progress falls into four steps under the assumption of free decision-making. With appropriate land chosen as a target (siting), the landowners play the three active roles of knowing, weighing up, and deciding. The decisions depend on two assumed scenarios respectively: voluntary participation when payments are ongoing and voluntary participation when payments are over.

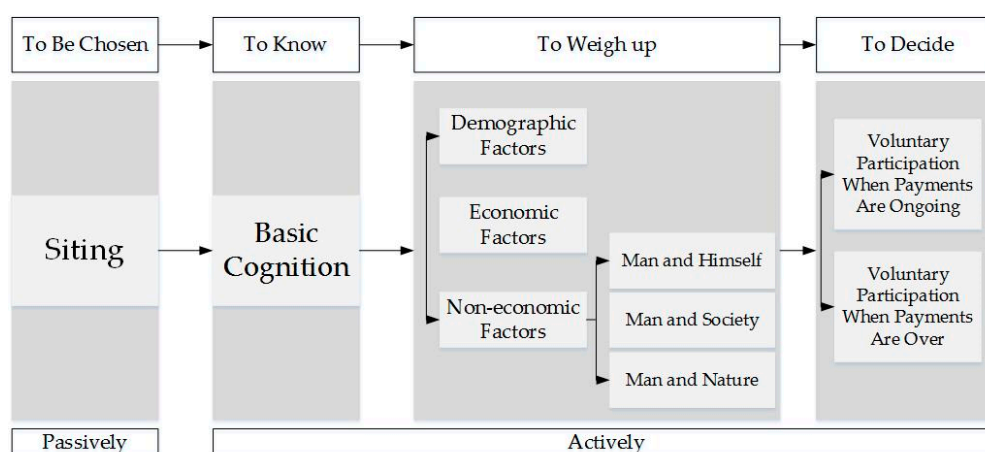


Figure 2. Evaluation framework of participation willingness in PES programs under the assumption of voluntary participation

In the demographic group, the three basic factors of age, educational level, and gender have been recorded. The economic group has been divided into four parts: the total, on-farm, and off-farm incomes, as well as the payments from the PLDL program.

There are four subgroups in the non-economic group. First, the basic cognition subgroup set questions to test the understanding of the PLDL program as what it is, why to participate in it, and how to do so. Actually, the PLDL program is aimed at dealing with the shortage of water quantity caused by

natural, economic, and over-population problems in Beijing and the degradation of the water quality because of agricultural pollution in the upstream, which may not be understood by the local farmers; Second, in the ‘man and himself’ subgroup, three questions explored what respondents think about the ethics of providing Beijing with clean water. One is ‘should the state or central government prioritize water supply for Beijing’. The other is ‘should local government and local farmers prioritize water supply for Beijing’, and the last one is ‘should your lifestyle change for the sake of others’, which tests farmers’ altruistic motivations. Respondents answered using a five-point scale; Third, the ‘man and society’ subgroup detects the impacts of the social environment on farmers’ decisions. Some related research indicates that a farmer’s decision would be affected by the neighborhood [8,36]. In comparison, the last man and nature subgroup distinguishes the impacts of water environment of both quantity and quality. That PES programs may improve the ecological environment and benefit locals in the long run could enable local participation [37]; thus the respondents’ perceptions of the water environment on different temporal and spatial scales have been considered; Finally, the participation decisions group investigates decisions of voluntary participation under ongoing payment or termination of the PLDL program. In addition, it considers whether respondents were satisfied with the present payment or supported the PLDL program.

3.2. Household Survey

Then we have undertaken a random sample survey among farmers participating in the PLDL program in Chicheng County for the purpose of gathering information about influencing factors, which is the weighing part in the evaluation framework (Figure 2), and the deciding part of farmers’ intentions to voluntarily participate when payment is either ongoing or over. In the survey, five towns have been selected, and 2 or 3 large villages experiencing the PLDL program have been visited in each town. The survey team members entered the villages by themselves and randomly selected respondents. The survey was conducted in August 2014 among 97 farmers involved in the PLDL program that were selected randomly in 11 villages from the towns named Dongwankou, Ciyangzi, Yangtian, Houcheng, and Diao’e. Each household head or his spouse was interviewed for a period of 30–90 minutes, and we obtained 93 valid questionnaires with an effective rate of more than 95%.

3.3. Statistical Methods

Based on the evaluation and selection of all the related factors, this study statistically utilizes *t*-tests and a logistic regression model to establish what significantly affects two kinds of voluntary participation; when the payment is ongoing or over. *t*-tests are applied to compare the differences between the collected data of two groups. The logistic regression model is popular for analyzing the probability of a series of independent variables influencing a binomial dependent variable and is used commonly in statistical empirical analysis. Recently, it has been used widely in geography [15,16,18] and therefore is suitable for the binary decision of this geographical study; that is, the ‘to do or not to do’ decision. The dependent variable is set as the decision choice. The independent variables are the demographic, economic and non-economic factors in the framework. The statistical methods are operated in SPSS 16.0 (SPSS Inc., Chicago, IL, USA).

4. Results

4.1. Survey Results

4.1.1. Demographic and Economic Factors

Table 1 shows that the average age of respondents was 53.42 years and the education level was as low as 2.26, which means education years is slightly more than 6 years. This situation fairly resembles related research in China and some developing countries [14,18], yet there is a big gap in the average

education level compared with developed countries [15]. In addition, there were fewer females than males among the interviewees.

The local households had poor economic circumstances, with an average total family income of 22.96 thousand yuan and a per capita income of only about 5.74 thousand yuan in 2013 (Table 1). These data are far lower than contemporary data of rural net per capita incomes in China, Beijing Municipality, Hebei Province, and Chicheng County, which were 8.90, 18.34, 9.10, and 8.08 thousand yuan, respectively. In the sample, off-farm income dominated income at 15.42 thousand yuan or 67.2% of total income (Figure 3). This result is close to the former survey in a larger PLDL program area [30]. On-farm income was only about one third of off-farm income, namely 26.2%. Households in this study showed more dependency on agriculture in comparison to the former data (the former data is from the study covering the entire area of the PLDL program in the Miyun Reservoir, which includes Luanping County, Fengning Manchu Autonomous County, and Miyun County, as well as Chicheng County) with a 15.2% dependency on agriculture [30], which is probably because of fewer opportunities for off-farm work in this county.

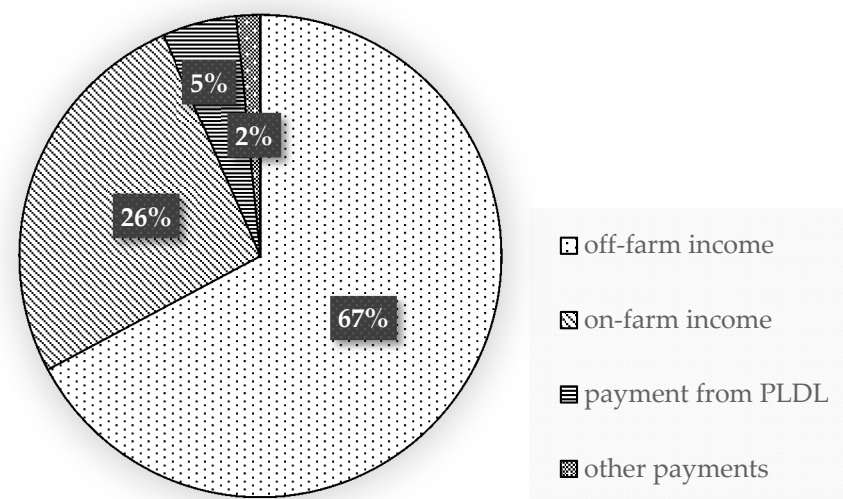


Figure 3. Household income composition.

On average, a household held 0.46 ha of land, of which about half was enrolled in the PLDL program. However, with regard to the PLDL payment, only 22 of 93 households (23.7%) admitted to receiving a standard yearly amount of 8250 yuan per hectare. As many as one third of respondents stated they were compensated for half this amount and eight respondents stated they received nothing (with many reasons, but mostly because farmers did not know what exactly the standard of involved paddy land and the real payment amount were). The same was reported in the Grain for Green Program [26].

4.1.2. Basic Cognition of the PLDL Program

This survey found that the average degree of awareness of the reason for the PLDL program was about 60%, while awareness of its implementation was as low as 23%. Only 12 of 93 (12.9%) respondents knew what PES was and considered the PLDL program to be a type of PES program. The low degree of basic cognition is reflected in such statements as 'I did not know rice cultivation was not allowed until the officials came to measure the land', and 'I do not know any other places participating in the PLDL program'.

Table 1. Influencing factors, descriptions, units, and data.

Types of Variables	Variables	Description of Variables	Units of Measurement	Mean	SD
1.1 Demographic factors	Age	Age	Years	53.42	12.07
	Edu	Educational level	Illiterate = 1; Primary school = 2; Junior middle school = 3; Senior high school = 4; Technical college and higher = 5	2.26	1.07
	Gender	Gender	Male = 1; female = 0	0.60	0.49
1.2 Economic factors	Total_inc	Total income of household in 2013	Thousand yuan	22.96	18.63
	Farm_inc	On-farm income of household in 2013	Thousand yuan	6.02	7.51
	Off-farm_inc	Off-farm income of household in 2013	Thousand yuan	15.42	16.76
	Payments_PLDL	Payments from the PLDL program to the household in 2013	Thousand yuan	1.14	1.03
	Other_sub	Other household subsidies in 2013	Thousand yuan	0.37	0.88
	Prop_off farm	Proportion of off-farm income to total household income in 2013	%	54.8	32.0
	Total_land	Owned by household	ha	0.46	0.30
	Land_in	Land in the PLDL program	ha	0.22	0.19
1.3 Basic cognition	Prop_land_in	Proportion of land in the PLDL program to total land	%	54.6	32.0
	Why_PLDL	Know why to start PLDL program	Yes = 1; no = 0	0.60	0.39
	How_PLDL	Know how to implement PLDL program	Yes = 1; no = 0	0.23	0.42
	PES_awareness	Know what PES is	Yes = 1; no = 0	0.13	0.34
1.4 Man and himself	PLDL_PES	Know that PLDL program is a PES program	Yes = 1; no = 0	0.13	0.34
	State_prio	Degree of priority of PLDL program for (PRIO) the state government	Scores 1–5, the bigger, the greater priority	4.72	0.61
	Local_gov_prio	PRIO the local government	Scores 1–5, the bigger, the greater priority	4.05	1.28
	Farmer_prio	PRIO local farmers	Scores 1–5, the bigger, the greater priority	3.25	1.67
1.5 Man and society	Altruistic	Should change lifestyle for the sake of others	Scores 1–5, the bigger, the more should be	3.95	1.54
	Neighbor_impact	Decision-making is impacted by the neighborhood	Yes = 1; no = 0	0.17	0.27
	Village_head_impact	Decision-making is impacted by the village head	Yes = 1; no = 0	0.30	0.46

Table 1. Cont.

Types of Variables	Variables	Description of Variables	Units of Measurement	Mean	SD
1.6 Man and nature	Quantity_past	Perception of water quantity of nearby river before the PLDL program	Scores 1–5, the bigger, the more	4.10	1.08
	Quantity_present	Perception of water quantity of nearby river at present	Scores 1–5, the bigger, the more	1.94	0.98
	Quantity_future	Perception of water quantity of nearby river in the future	Scores 1–5, the bigger, the more	2.15	1.25
	Water_sav	PLDL program has saved much water	Yes = 1; no = 0	0.83	0.38
	Quality_past	Perception of water quality of nearby river before the PLDL program	Scores 1–5, the bigger, the better	3.7	1.28
	Quality_present	Perception of water quality of nearby river at present	Scores 1–5, the bigger, the better	3.29	1.49
	Quality_future	Perception of water quality of nearby river in the future	Scores 1–5, the bigger, the better	3.37	1.56
	Water_imp	PLDL program has improved water quality	Yes = 1; no = 0	0.63	0.48
	Quantity_Beijing	Perception of whether water quantity in Beijing has increased because of PLDL	Scores 1–5, the bigger, the more	2.87	1.26
1.7 Attitudes and decisions	Quality_Beijing	Perception of whether water quality in Beijing has improved because of PLDL	Scores 1–5, the bigger, the more	3.14	1.36
	Satis_payment	Satisfied with the standard payment amount	Yes = 1; no = 0	0.40	0.49
	Support_pro	Supportive of the PLDL program	Yes = 1; no = 0	0.89	0.31
	Participation_1	Voluntary participation when the present payment is ongoing	Yes = 1; no = 0	0.74	0.44
	Participation_2	Voluntary participation when the present payment is over	Yes = 1; no = 0	0.41	0.49

4.1.3. Man and Himself: Altruistic Motivations

The results in Tables 1 and 2 showed that respondents considered that the state should take the most responsibility for Beijing's water provision. Without exception, respondents considered farmers the least responsible. However, from an ethical perspective, respondents gave significantly more weight to altruistic motivations than farmers' responsibility owing to empathy and sympathy, representing ethical agreement on the PLDL program. Respondents' ethical considerations are reflected in the following statements: 'We are as close as lips and teeth to Beijing' and 'It is pathetic to have no water to drink'.

Table 2. Scores of inner values and paired *t*-test.

Scores		State_prio	Local_gov_prio	Farmer_prio	Altruistic
4.72	State_prio	-			
4.05	Local_gov_prio	**	-		
3.25	Farmer_prio	**	**	-	
3.95	Altruistic	**	Not significant	**	-

** significant at $p < 0.01$.

4.1.4. Man and Society: Impacts from Social Environment

Eighty-five percent of all respondents denied being influenced by their neighborhoods when they decided whether to participate in the PLDL program and gave village head approval ratings of 30% (Table 1). This result was in line with expectations. Psychologists have found that people in northern China tend to be more independent and think more analytically than those in rice-growing southern China, who have characteristics of collectivism, interdependency, and holistic thinking [38,39]. In addition, historical factors led to a mentality of individualism in the villages of north China. The factors include that dwellers moved frequently, clans faded, collective organizations collapsed owing to constant wars, and populations were affected by natural disasters and poor survival conditions, while the most important is a mentality of private ownership on land [40–42]. Thus, the assumption that the decision-making process is influenced by social environment can be discarded in this study area.

4.1.5. Man and Nature: Impacts of Water Environment

According to Table 1, 83% of all respondents agreed on the water-saving effect of the PLDL program, and 63% considered it to have improved water quality. By scoring respondents' perceptions of water quantity and quality in rivers near their villages across time (before the PLDL program, at present, and in the future) and conducting a paired *t*-test, we observed that they perceived a significant decrease ($p < 0.01$) in water quantity since the PLDL program came into effect (Figure 4). Although they anticipated a significant increase ($p < 0.05$) in the future, the increasing range is not much. They showed little confidence in regaining the same amount of water as that before the PLDL program, mostly because of the drought continuing for several years. As for water quality, respondents considered it as relatively good consistently in spite of the PLDL program. However, scientific research shows that the PLDL program has improved both quantity and quality of water, with an increase in quantity of 18.2 million m³, which amounts to 5% of the average annual runoff of the Miyun Reservoir, and a decrease of 10.36 t of total nitrogen (TN) and 4.34 t of total phosphorus (TP) [30].

As for Beijing, we observed that the respondents considered both water quantity and quality in Beijing to have improved moderately, with scores of 2.87 and 3.14, respectively (Table 1), so the results revealed a contradiction. On the one hand, not all respondents agreed on the effect of the PLDL program on water quantity and quality in nearby rivers; some even sensed a huge decrease in water quantity and almost no change in water quality, which differs from what scientific researchers have found. On the other hand, respondents trusted their moderate contribution to the quantity and quality

of water in Beijing. With regard to temporal scales, respondents nearly did not recognize the impact of PLDL program, but for the spatial scales, they acknowledged the achievement for water supply in Beijing. The contradiction may be caused by vague memory, a lack of general scientific knowledge, and different sampling sites.

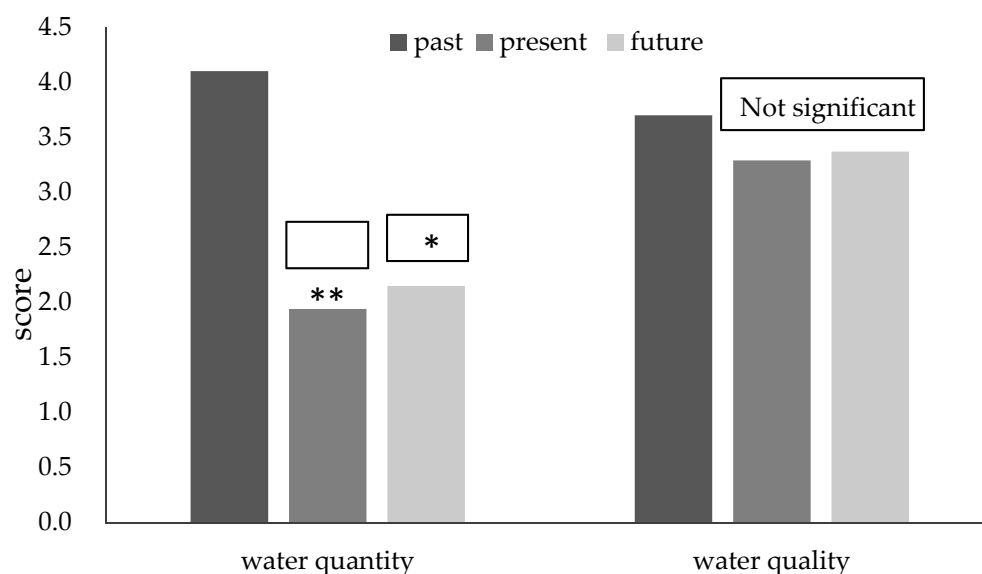


Figure 4. Scores of perception of water quantity and quality across time; paired *t*-tests were matched on the present-past and future-present pairs. ** significant at $p < 0.01$, * significant at $p < 0.05$.

4.1.6. Participation Decisions

Tables 1 and 3 show results for the intention to participate and attitudes. Scores for satisfaction with the present payment and voluntary participation without any payment were almost the same at 0.40 and 0.41, respectively, and were significantly lower than the other two scores. This dissatisfaction with the payment and high proportion of reconversion is similar to the Grain for Green Program in China [24,34,43,44], but the proportion of reconversion is much lower than the samples in 2011 [30], which was 0.88. The highest score was for the support rate (0.89), which is significantly higher than the other three scores. Moreover, the ratio of voluntary participation with the present payment is 74% and only 41% without the payment. This shows the incentive effect of payments on participation and serves as a reminder that as many as 26% of farmers feel forced into the PLDL program with their aspirations ignored and their livelihoods impacted dramatically. Therefore, to guarantee the long-term sustainability of the PES project, these farmers' needs should be emphasized more.

Table 3. Scores of attitudes and decisions and paired *t*-test.

Scores		Satis_payment	Support_pro	Participation_1	Participation_2
0.40	Satis_payment	—			
0.89	Support_pro	**	—		
0.74	Participation_1	**	**	—	
0.41	Participation_2	Not significant	**	**	—

** significant at $p < 0.01$.

4.2. Influencing Factors of Decision-Making in Two Scenarios

We use a logistic regression model to explore the influencing factors of voluntary participation in two different scenarios. Sections 4.1.1–4.1.5 indicate and analyze respondents' demographic, economic, and non-economic characteristics. The interviewees have relatively low basic cognition of

the PLDL program, relatively high altruistic value, and vague perceptions of environment. In particular, we exclude the effects of social environment as illustrated in Section 4.1.4. In line with the principles of scientific methodology, representativeness, and typicality, we chose nine factors as covariates in the logistic regression model (see Table 4).

Table 4. Results of logistic regression model; ongoing or stopped payments.

Covariates	Scenario 1: Ongoing Payment					Scenario 2: Stopped Payment				
	B	S.E.	Wald	Sig.	Exp(B)	B	S.E.	Wald	Sig.	Exp(B)
Gender	−0.410	0.648	0.400	0.527	0.664	0.207	0.509	0.165	0.685	1.230
Age	−0.021	0.030	0.489	0.484	0.979	0.068	0.026	7.133	0.008 ***	1.071
Edu	−0.459	0.274	2.814	0.093 *	0.632	0.199	0.236	0.708	0.400	1.220
Prop_off farm	1.676	0.931	3.244	0.072 *	5.346	0.998	0.778	1.643	0.200	2.712
Prop_land_in	−0.292	1.047	0.078	0.780	0.747	0.150	0.808	0.034	0.853	1.161
Payments_PLDL	−0.265	0.298	0.790	0.374	0.767	−0.392	0.276	2.025	0.155	0.676
Basic_cog	−2.652	1.216	4.757	0.029 **	0.071	−0.769	0.980	0.616	0.433	0.464
Altruistic	0.563	0.202	7.792	0.005 ***	1.755	0.016	0.171	0.009	0.925	1.016
Eco_perception	0.905	0.948	0.913	0.339	2.473	0.116	0.742	0.024	0.876	1.123
Constant	1.367	2.171	0.397	0.529	3.925	−4.697	1.948	5.814	0.016 **	0.009

Scenario 1: Hosmer and Lemeshow Test: chi-square = 8.287, df = 8, Sig. = 0.406 (>0.05); -2 Log likelihood = 80.035, Cox and Snell R Square = 0.245, Nagelkerke R Square = 0.360. Overall percentage of right prediction = 79.6%; Scenario 2: Hosmer and Lemeshow Test: chi-square = 6.292, df = 8, Sig. = 0.615 (>0.05); -2 Log likelihood = 112.039, Cox and Snell R Square = 0.144, Nagelkerke R Square = 0.194. Overall percentage of right prediction = 66.7%; B: the partial regression coefficient of each covariate; S.E.: the standard error; Wald: tests whether the coefficient has the statistical significance; Sig.: the statistical significance of each covariate; Exp(B): the exponential value of B; N = 93. *** significant at $p < 0.01$; ** significant at $p < 0.05$; * significant at $p < 0.1$.

In Scenario 1, the payment is ongoing. Given a hypothetical background of free decision-making, voluntary participation is influenced significantly by two non-economic factors; basic cognition (−) and altruistic motivations (+). Education (−) and the ratio of off-farm income to total income (+), which are demographic and economic factors, also play a role to some extent. In other words, there is more likelihood of participation when basic cognition and education are lower and altruistic motivations and the proportion of off-farm income are higher (Table 4).

For economic factors impacting decisions in Scenario 1, the increase of the proportion of off-farm income could probably break the dependence of farmers on agricultural activities. Labor release along with land change from paddy to dry land is likely to extend varieties and numbers of livelihood activities of families participating in the PLDL program. Consequently, a family with a high proportion of off-farm income is more likely to adapt comparatively well to the PLDL program and be more willing to be involved in it.

The survey suggests that altruistic strength would be effective in the PLDL program as altruistic motivations (+) positively facilitate voluntary participation. In other words, although the high ratio of off-farm income would lead to less drive for cultivating paddy land, respondents tended to accept the PLDL program from an altruistic viewpoint. This ethic virtue of the farmers may potentially contribute to the sustainability of PES programs, though only depending on altruistic motivations is far from enough.

The results for basic cognition (−) and education (−) were puzzling, creating an illusion that less knowledge of PES programs brought greater participation. This differs from the mainstream opinions [18,45] and should be an interesting finding in our survey. Unlike the belief that educated people find it easier to understand environmental management, our result reveals that people may have declined to participate when they were aware of the side effects caused by PES programs, especially when they have vague cognitions. There is superficial knowledge and even a misunderstanding of the PES programs due to insufficient publicity and knowledge in villages and deficient capacity to access scientific knowledge because of generally low education levels.

Against this background, uneducated people choose to believe all of the policy issued from government, whereas insufficiently educated people tend to suspect the local government.

In Scenario 2, there are no payments. The influences in Scenario 2 are significantly different to those of Scenario 1. Age (+) is the uniquely significant impacting factor, which means the older the respondents are, the greater is the chance of voluntary participation without any compensation (Table 4). It can be predicted that if the PLDL program is terminated and Beijing Municipality no longer provides payments, older participants are more likely to stay the same and not grow rice. The average age of respondents in this research is on the high side. Actually, the higher a person's age is, the weaker is their ability to work in the paddy lands, which require more intensive planting activities than do dry lands. Thus, older people could be more willing to be enrolled despite no payments. On the other side, most of the factors cannot influence the decision when the payment stopped, which reveals a phenomenon of 'no pay, no care'.

Comparing the two scenarios and their influencing factors might produce interesting insights. In both scenarios, the three factors, gender (demographic factor), the proportion of PLDL land to total land (economic factor), and the perception of the water environment (non-economic factor), failed to play a significant part in participation decisions. The non-significant impact of gender may be for the reason that our PES case is a household decision rather than individual. The proportion of involved land has little direct influence on decision-making, probably because the income decrease from the paddy land transformed to dry land is in a limited proportion of total household income. Although scholars considered that the improvement of the environment benefited locals and, therefore, could contribute to farmers' participation [37,46], in our survey, the farmer's unclear perceptions of the water environment suggested that perception of the environment did not act significantly in the decision process of whether to participate.

Non-economic factors play a more significant role in affecting participation decisions than do demographic and economic factors when subsidized. Nevertheless, the effects of various factors become complicated when payments are cancelled. It can be noted that the simulation effect of the logistic regression model in Scenario 2 is no better than that in Scenario 1 (in Table 4, see the overall percentage of right prediction). The reason might lie in the limits of educational level, which are personal limitations caused by the rural environment, and vagueness of perceptions across time and space. Furthermore, it might be a difficult task for respondents to make decisions by imagining a no payments situation when compensated. Thus, we can comprehend the relative ambiguity of their response in the interview and the lower fitness of the logistic model in Scenario 2.

5. Discussion

5.1. Influence of Non-Economic Factors

That non-economic factors impact significantly on decisions to participate in PES programs is not unusual [16,19–21]. In our PLDL case, given a background of voluntary participation, non-economic factors are found to impact significantly on farmers' decisions when subsidized. However, a high willingness of participation in PES programs derives from relatively high altruistic motivations, low education, and vague basic cognition of the PLDL program. Cognition and altruistic motivations have become significant forces, which may have not been considered believable in a poverty-stricken area of a developing country such as China because of the economic hypothesis of the 'rational man', who is considered not to give way to blind decision-making and whose only target is to maximize economic benefits. However, the 'rational man' hypothesis itself does not correspond to reality and the model is comprised of simplified assumptions, and the significant effects from cognition and altruistic motivations are indeed not impossible [47].

In PES programs, the effects of economic factors are not uniquely important, while non-economic factors are displaying their significant impact on farmers' decisions to participate in PES programs. Non-economic factors, such as moral strength, sympathy and empathy for humans and nature,

and information dissemination, are applicable in developed countries with high per capita gross domestic products and a high level of social development [15,20,45] but also in developing countries [16,18,21]. These internal incentives could affect the farmers' decisions to enhance the long-term effectiveness of PES programs [48].

In our case scenarios, despite the positive effect of altruistic strength on participation willingness, the negative effects of basic cognition and educational level on the involvement in PES programs are unexpected but reasonable. In the mountainous area of China, there is a lack of popularization of awareness of environmental protection in rural villages, farmers probably have low levels of education, and there is a vague perception of the water environment across time and space. Compared with the uneducated people following PES blindly, the insufficiently educated people might misunderstand PES programs and even have a negative psychological view of them. Investment in education in rural areas and popularization of the consciousness of environmental protection would be helpful not only to enhance people's understanding of natural ethics, sense of mission, and PES programs, but also to expand the livelihood of farmers and enhance their ability to make long-term decisions and positively affect their decision-making about participation willingness. When people's knowledge is raised to a higher status, the attitude and cognition of local residents would help proper protection management [49,50]. Therefore, an improvement of educational level and the creation of such awareness would be extremely important for the implementation of PES programs [51], especially in rural areas, which are the main target of PES programs [11,52].

5.2. Voluntary Participation and Poverty Alleviation

In China, the PES mechanism has been in a state of initial exploration since 2005, when the State Council of the People's Republic of China proposed the PES mechanism 'to improve the ecological compensation policy and to establish the mechanism for ecological compensation as soon as possible'. The gradual development of PES programs in China is accompanied by the challenges of a large population, a booming economy, and a reaffirmation of environmental protection to construct ecological civilization (as per the 18th CPC National Congress), yet is practiced with the traditional institutional thinking of compulsory implementation. To achieve the effectiveness of a policy or project, scientific correctness is far from sufficient and voluntary support from participants is in need [53,54]. Unfortunately, the PES programs profitable directly for locals are implemented through top-down command and control, which brings regional unbalance [55,56]. Although the top-down command and control method could increase the proportion of both voluntary and involuntary participation rapidly in a short period [18], forcing families into PES programs might not be conducive to the livelihood of households. It would probably increase the government's administrative costs and might damage the long-term sustainability of the program. Therefore, a new mechanism should be explored to meet these challenges. It is necessary to study factors affecting farmers' participation in PES programs under the new institutional thinking, which assumes voluntary transaction and voluntary participation.

In our survey, as many as 26% of all respondents declared themselves to be involved involuntarily in the PLDL program, and the rate rose to 59% in a payment stopped scenario, compared to the even more than 88% in the 2010 survey [30]. It indicates the important role of payments if voluntary participation is achieved. Thus, to obtain satisfied sustainable voluntary participation in the PLDL program, an appropriate economic compensation should be determined firstly and attention should be paid to other factors afterwards, according to our survey. As stated in Section 5.1, altruistic strength and probably comprehensive understanding and cognition of the PES programs caused by the improvement of educational level and creation of environmental awareness could promote participation. In addition, the PLDL program changes livelihoods and releases the labor force from paddy land requiring intensive labor. It is suggested to lead the released labor force to alternative ways and to increase off-farm income effectively, in order to support for voluntary participation in PES programs.

Maslow's theory of levels of demand divides people's demands into basic survival demands and higher demands to live life. Only when lower needs are satisfied may higher demands be behavioral

incentives; thus it would violate human instinct to ignore low levels of demands or to force a family to comply with environmental ethics in developing countries [57]. Lower demands refer to physical needs and safety requirements, such as health, property, and family security [58]. Although the main goal of PES programs is to achieve good environmental management, poverty alleviation should also be considered in the design when the lower demands of the poor are threatened [59,60], and quite a number of cases have proved PES to have positive impacts on poverty alleviation [11,27,35]. In this study, Chicheng is a typical poverty-stricken county, whose local farmers face extreme poverty, yet must assume ecological responsibility for protecting Beijing. The PLDL program could be considered a simultaneous attempt to protect water resources and solve the problem of rural poverty [30]. Moreover, focusing only on the amount of payment is not enough. It is also necessary for PES programs to provide technical assistance to help labor transfer to other sectors and increase the proportion of off-farm income for sustainable livelihoods.

6. Conclusions

Using household survey data and a logistic regression model, this study attempts to understand the non-economic influencing factors of farmers' decision making on involvement in PES projects. In analyzing the factors affecting farmers' decisions to participate in the PLDL program, we assumed voluntary participation. We can expect there would be some subtle differences between decisions made under the assumption of voluntary participation and those made under the reality of voluntary participation. Nonetheless, owing to widespread attention to, continuously developing mechanisms for, and the long-term sustainability goal of PES programs, voluntary participation could be foreseen in the future. As a first step to explore the feasibility of voluntary participation in China, the results of the voluntary participation rate, to some extent, could be considered acceptable (74% versus 100% forced participation) in our study. Thus an optimistic future when voluntary participation becomes a reality in the nation could be expected.

The survey results remind us of the emerging significant effects of non-economic factors on the decision-making of joining the PES program, although demographic and economic factors also matter. The implementation of PES programs requires all the stakeholders to be involved. The more power one group obtains, the more unbalanced is the power structure in the program, as the stakeholders in different parts could not have the same right of negotiating and deciding, and there exists a big threat to sustainability. Non-economic factors, such as altruistic motivations, can help achieve balance when the imbalance is not severe, but that is far from enough. For serious imbalance in a completely mandatory program, non-economic factors, such as misunderstanding caused by insufficient education, might promote an imbalance. Thus, the demographic, economic, or non-economic factors should be prioritized according to different situations for successful implementation.

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