Understanding the attitudes and practices of paddy farmers for enhancing soil and water conservation in Northern Iran

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Original Research Article

Understanding the attitudes and practices of paddy farmers for enhancing soil and water conservation in Northern Iran☆

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ABSTRACT

The objective of this paper was to identify the factors affecting rice growers' attitudes and practices towards water and soil conservation in the Fumanat Plain of Guilan Province, Iran. Data were collected through a survey questionnaire addressing a cross section of 400 rice growers of the Fumanat Plain in four districts. Data were analyzed using both summary statistics and multivariate statistical procedures while content validity of the statements was first determined by a group of experts of water and soil conservation. It was found that more than 23% of the variance of attitudes towards water and soil conservation could be determined by a linear combination of variables included in a regression equation. Identifying the factors affecting rice growers' attitudes is suggested as a way of integrating rice cultivation into rural development. From a practical point of view, the above mentioned implications are of great importance generally for society, policy makers and related economic sectors.

1. Introduction

Economic growth of developing countries mainly depends on the performance of the agricultural sector and its role in the management of natural resources (Gylfason, 2001). However, most developing countries gradually are losing their natural resources (both quality and quantity) due to severe droughts, floods and human intervention (Mengstie, 2009). The success of conservation programs of natural resources and their optimum use requires the understanding of various aspects of human behavior because human behavior is the result of individuals' attitudes about the conservation of these resources.

Farmers' positive or negative attitudes about soil conservation practices can affect their behaviors about the adoption of water and soil conservation (WSC) practices (Fishbein & Ajzen, 1975; Shafiee, Rezvanfar, Hossini & Sarmadian, 2008).

Water and soil are two major issues in changing attitudes from ultra-sector to intra-sector parameters for keeping the sustainability. Despite its important role in improving the performance of agriculture and food security, irrigation water is becoming a scarce resource (Bruinsma, 2009; FAO, 1992). Overall, soil erosion is initiated when human activities disrupt the equilibrium of nature. So, the programs of conserving natural resources and their optimum use can succeed if different aspects of human behavior are understood because these behaviors are the result of their attitudes. Farmers' positive or negative attitudes about soil conservation practices can affect their behavior towards the adoption of these practices. Therefore, attitude can be regarded as a desire to respond to an idea/situation in a special manner. The study of individuals' attitudes about different issues is important because it can help managers and executives understand people's mentalities about certain issues (Shafiee et al., 2008).

Unfortunately, because of over exploitation of agricultural water resources, Iran faces serious constraints in its water supply which challenges the achievement of agricultural water management objectives. Today, a lack of technical knowledge, farmers' attitudes and skills and farmers' training about the application of sound practices of agricultural water management can be blamed for the low efficiency of irrigation water use (Shahroudi & Chizari, 2006). Regionally, programs for conserving natural resources and their optimum use can succeed if various aspects of human behaviors are understood because these behaviors are the result of their attitudes about the

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conservation of these resources.

Factors affecting farm-level adoption of water and soil conservation practices include such variables as job training and farmers' perception of soil erosion (Sidibé, 2005). Farmers who are inclined to adopt technologies and practices for the conservation of basic resources (water and soil) fulfill them when they obtain their expected profitability (De Graaff et al., 2008; Ellis, 1993; Feder, Just & Zilberman, 1985). In a study on key factors affecting investment on water and soil conservation practices, Kessler (2006) concluded that these practices were fully adopted only when farmers used them continually and integrated them with their farming system. Sain and Barreto (1996) revealed that most farmers had positive attitudes towards soil conservation and that their awareness of soil erosion was high, but they did not adopt soil conservation technologies because these technologies were mostly very complex and expensive and had no direct, short-term profit.

Pannell (1999) related the low level of adoption of conservation technologies to their high implementation costs, the need for long-term investment, lack of visible and direct final results, lack of conservation morality and sustainability culture among farmers, and farmers' inappropriate attitude about protection and sustainability. In a study on barriers to irrigation water conservation in the Rio Grande Basin and the challenges and opportunities for its extension, Ward, Michelsen, and DeMouche (2007) identified various barriers to water conservation among which the most important ones were limitations of water transfer, virtual water storage, incorrect water conservation, attitude towards conservation, land-owning type, and unclear function of water. They revealed that water price was the main factor affecting water conservation. Low water price hinders water conservation even if other institutions develop water conservation. In contrast, high water price encourages water conservation even in the presence of other discouraging factors.

In a comparison of soil conservation adoption models in Khuzestan Province, Iran, Noorollah-noorivandi, Ajili, Chizari, and Bijani (2012) concluded that from a demographic perspective, knowledge and attitude, ownership, technology and income resulted in significant differences among three soil conservation practice adopter groups. In their attempts to develop an integrated model, they included the variables of land area, income, crop yield, mechanization level, loads and total owned land, age, literacy level, attitudes about soil conservation technologies, social status, social participation, the use of information sources, and technical knowledge about soil conservation technologies as effective constructs for predicting high-adopting farmers in their model. In an opinion poll about soil conservation operations from farmers' perspective in Karkheh and Dez watersheds, Shafiee et al. (2008) found that most farmers had positive attitudes towards soil conservation. Their analysis of correlation showed a positive, significant relationship of attitude toward soil conservation practices with the extent of using communication channels and information sources and cosmopolitan features. Karimi and Chizari (2007) reported positive, significant relationship between farmers' attitudes towards soil conservation. In addition, most farmers had positive attitudes to soil conservation.

The main purpose of the present study was to examine small-scale farmers' attitudes towards water and soil conservation in the Fumanat Plain of Guilan Province, Iran and to determine factors shaping these attitudes in order to recognize factors affecting farmers' decision-making about adoption of water and soil conservation practices in this plain for policy-makers, farmers, researchers and those involved in the agriculture sector. The following research objectives guided the study:

1. Describing demographical, economic and technical characteristics of paddy farmers,
2. Identifying the main sources of information seeking about soil and water conservation practices among paddy farmers,
3. Identifying determinants of paddy farmers attitude towards soil and water conservation.

In the next section we describe the methodological framework including the escription of the study area, the data collection and the employed statistical modeling. In the third section we present the summary statistics, the multiple regression analysis scores and generally the results.

2. Materials and methods

The study area was composed of the irrigation and drainage network of the Sefīd-Rūd River in the Fumanat Plain of Guilan Province, Iran. The Fumanat Plain is located in the central part of Guilan Province which is fed by the Anzali lagoon watershed. Its total geographical area is over 84,310 ha out of which 56,774 ha is under rice cultivation. The region is inhabited by over 56,908 households with a population of 255,199 out of which 52,086 households are rice growers. The present study was carried out as a survey. Its statistical population was composed of rice growers living in the Fumanat Plain (N=52,086) out of which 400 small-scale farmers were selected as the study sample by the table of minimum sample size proposed by Bartlett, Kotrlik, and Higgins (2001).

Questionnaire was used as the main research tool for studying rice growers' attitudes towards water and soil conservation practices. The dependent variable was respondents' mean total attitudes towards water and soil conservation practices. Dependent sector of the questionnaire related to rice growers' attitudes about water and soil conservation practices was composed of 13 5-point Likert items for which respondents showed their level of agreement. Since the responses were expressed in a range from 1 (strongly disagree) to 5 (strongly agree), attitudes were categorized in the four following groups by Interval of Standard Deviation from the Mean (ISDM) formula in order to describe the distribution of participants' attitudes (Pezeshkirad & Naeemi, 2010):

A=weak attitude, A < Mean-SD
B=moderate attitude, Mean-SD < B < Mean
C=good attitude, Mean < C < Mean+SD
D=excellent attitude, Mean+SD < D

In addition, the independent variables were respondents' demographic attributes including age, educational level, farming and non-farming income, and land area. Content validity was determined by a panel of experts of water and soil conservation including academics, policy makers and staff members of relative companies and local authorities. After a preliminary test, the reliability coefficient of Cronbach alpha of the dependent multi-item statement was estimated and found equal to 0.901 (> 0.700) showing acceptable reliability of the questionnaire and significant homogeneity of its items.

The main variables of the study were estimated and described using frequencies, percentages, mean scores and standard deviations (SD). The relationships among dependent and independent variables were firstly examined in the inferential analysis and afterwards the contribution of each variable in predicting farmers' attitudes towards water and soil conservation were estimated employing multiple regression analysis (MRA). In this paper MRA (Stolzenberg, 2004) was used to optimally handle the categorical variables in order to find out possible relations between a dependent variable and a set of selected independent ones. All data analyses were carried out by using SPSS v.21 for windows.

3. Results

According to the summary statistics (Table 1), mean respondent of the study was a married male, 49 years old who lives in a family with 4.82 members. Additionally, his mean work experience was 30.80 years

Table 1
Frequency distribution of rice-growers demographic information (n=400).

Characteristics	Groups	Frequency	Percentage	Mean	SD
Age (years)	< 30	17	4.2	49.60	11.050
	30–40	82	20.5		
	40–50	130	32.5		
	> 50	171	42.8		
Gender	Female	10	2.5	–	–
	Male	390	97.5		
Marital status	Single	9	2.2	–	–
	Married	391	97.8		
Family size (person)	< 3	81	20.2	4.82	1.619
	3–6	272	68		
	> 6	47	11.8		
Level of education	Illiterate	81	20.2	–	–
	Elementary and intermediate	195	48.8		
	High-school and diploma	97	24.2		
	Academic education	27	6.8		
Experience in rice growing (years)	< 20	128	32	30.80	13.605
	20–40	196	49		
	> 40	76	19		

and only 6.8% of the sample holds a university degree.

On the other hand, respondents have four heads of livestock and 35 hens, on average. Their mean rice yield was 2,900 kg and mean farming annual cost was 2,900,000 IRR. Respondents' mean annual income from rice growing was 82,740,000 IRR with most of them having low income in the range of < 60,000,000 IRR. Respondents' mean annual non-farming income was 39,000,000 IRR while most respondents' main job was farming with only farming income (Table 2).

In addition, respondents' mean farm size was 1.59 ha and most of them had two plots. Most farms were privately owned and were mostly prepared by tractors and sown with local seeds. The irrigation water of the farms is mostly supplied by canals. Moreover, mean village distance to respondents' farms was 1.01 km and mean village distance from main road was 0.72 km (Table 3).

Table 4 summarizes rice growers' information sources for water and soil conservation. The most frequently referred resources were 'farmers

Table 3
Frequency distribution of rice growers' technical characteristics (n=400).

Characteristic	Groups	Frequency	Percentage	Mean	SD
Land size (ha)	< 1	193	48.2	1.593	1.105
	1–2	139	34.8		
	> 2	68	17		
Number of lands (No)	< 1	108	27	2.74	2.176
	2	123	30.8		
	3	86	21.5		
	> 3	83	20.8		
Farm distance to village (km)	< 0.1	83	20.8	1.017	1.353
	0.1–1	222	55.5		
	> 1	95	23.8		
Village distance to main road (km)	< 0.1	173	43.2	0.722	1.226
	0.1–1	168	42		
	> 1	59	14.8		
Grown cultivars	Local	368	92	–	–
	Bred	0	0		
	Both	32	8		
Land owning type	Privately owned	371	92.8	–	–
	Rented and crop-sharing	29	7.2		

Table 2
Frequency distribution of rice-growers' economic characteristics (n=400).

Characteristics	Groups	Frequency	Percentage	Mean	SD
Number of livestock (head)	0	125	31.2	4.18	11.413
	1–3	145	36.2		
	3–6	62	15.5		
	> 6	68	17		
Number of poultry (hen)	0	131	32.8	35.46	144.148
	1–25	113	28.2		
	25–50	117	29.2		
	> 50	39	9.8		
Annual farming income (million IRR)	< 60	236	59	82.745	8.074701341
	60–120	94	23.5		
	120–180	28	7		
	180–240	23	5.8		
	> 240	19	4.8		
Annual non-farming income (million IRR)	0	136	34	396.875	6.064286840
	< 30	102	25.5		
	30–60	81	20.2		
	> 60	81	20.2		
Rice production rate despite of land area (kg)	< 1500	118	29.5	2908.30	1596.649
	1500–3000	110	27.5		
	3000–4000	115	28.8		
	> 4000	57	14.2		
Total annual farming cost (million IRR)	< 10	53	13.2	297.820250	2.447732928
	10–30	217	54.2		
	30–60	96	24		
	> 60	34	8.5		

Table 4
Frequency distribution of the use of information sources (n=400).

Rank	Variable	Number of responses	Response (%)	Cases (%)
1	Farmers and neighbors	321	44.1	80.2
2	TV and radio broadcasts	281	38.6	70.2
3	Agriculture extensionists	98	13.5	24.5
4	Educational-extensional movies	14	1.9	3.5
5	Computer and internet	14	1.9	3.5
Total		728	100	182

and neighbors' (44.1%) and 'TV and radio broadcasts' (38.6%). The least frequently referred resources were 'agricultural extensionists' (13.5%), 'education and extensional movies' (1.9%) and 'computer and internet resources' (1.9%) (Table 4).

3.1. Rice growers' attitudes toward water and soil conservation

The results showed that mean most statements measuring farmers' attitudes about water and soil conservation were high, and in total, farmers had a positive attitude towards the protection of water and soil in the region. Attitude A (repair and maintenance of soil and water conservation technologies is necessary, M=4.30, SD=0.726) and attitude B(poor government policies and decisions affect the degradation of soil and water resources, M=4.25, SD=0.869) had the highest rating among the attitudes measures for farmers and Attitude L (over precipitation impact the degradation of water resources and soil, M=3.68, 191 SD=0.991) and attitude M (over-planting influences the degradation of soil and water resources, M=3.50, 192 SD=0.976) also had the lowest rank among the items (Table 5).

Since the responses were ranged from 1 (strongly disagreement) to 5 (strongly agreement), attitudes were segmented in four separate groups, according to the ISDM formula, in order to categorize the distribution of participants' attitudes (Pezeshkirad & Naeemi, 2010). Table 6 presents the above mentioned typology of rice growers' attitudes towards water and soil conservation in Fumanat Plain. It can be seen that 44.8% and 41.2% of respondents had good and moderate attitudes, respectively, towards water and soil conservation while 8.5% and 5.5% had poor and excellent attitudes, respectively.

Table 5
Frequency distribution of rice-growers' attitudes towards water and soil conservation in Fumanat plain (n=400).

Attitude	Mean	SD	Rank
Repair and maintenance of soil and water conservation technologies is necessary.	4.30	0.726	A
Poor government policies and decisions affect the degradation of soil and water resources.	4.25	0.869	B
Training of water and soil conservation practices is very helpful to us.	4.18	0.868	C
Soil erosion greatly harms crop production.	4.14	0.874	D
Soil erosion creates a lot of problems for paddy farms.	4.10	0.942	E
Extension advice on soil and water conservation practices is necessary.	4.06	0.895	F
Inconsiderate use of water and soil resources is increasing.	4.02	0.938	G
Correct use of water improves the long-term of profitability.	4.01	1.004	H
Unsuitable agricultural practices impact the degradation of water and soil resources.	4.00	0.722	I
Forest destruction affects the degradation of soil and water resources.	3.96	1.050	J
Overgrazing affects the degradation of soil and water resources.	3.82	1.017	K
Over-precipitation impact the degradation of soil and water resources.	3.68	0.991	L
Overplanting influences the degradation of soil and water resources.	3.50	0.976	M
Total	4.00	0.913	

Table 6
Frequency distribution and percentage of rice growers' attitudes towards water and soil conservation in Fumanat Plain (n=400).

Attitude	Frequency	Percentage	Cumulative percent
Weak (A < 3.087)	34	8.5	8.5
Moderate (3.087 < B < 4)	165	41.2	49.8
Good (4 < C < 4.913)	179	44.8	94.5
Excellent (D > 4.913)	22	5.5	100

Table 7
Results of correlation test of rice growers' attitude towards water and soil conservation with the studied variables.

Variables	Statistic	Coefficient of correlation	p-value
Village distance to main road	Pearson	-0.352^{**}	0.000
Rice production rate	Pearson	-0.290^{**}	0.000
Farm size	Pearson	-0.214^{**}	0.000
Educational level	Spearman	0.204^{**}	0.000
Family size	Pearson	-0.132^{**}	0.008
Cultivated cultivars	χ^2	5.729^{ns}	0.194
Marital status	χ^2	4.047^{ns}	0.256
Gender	χ^2	4.709^{ns}	0.126
Farming annual income	Pearson	0.112^{*}	0.025
Village distance to farm	Pearson	-0.066^{ns}	0.189
Non-farming annual income	Pearson	0.097^{ns}	0.054
Number of lands	Pearson	0.060^{ns}	0.233
Number of animal heads	Pearson	0.047^{ns}	0.351
Experience in rice	Pearson	0.044^{ns}	0.382
Total farming annual cost	Pearson	-0.039^{ns}	0.440
Number of annual poultry	Pearson	0.035^{ns}	0.490
Age	Pearson	0.004^{ns}	0.941

** $p < 0.01$.
* $p < 0.05$.

3.2. Relationship between studied attributes and rice growers' attitude

The correlations between quantitative variables were estimated by the Pearson test. Results shown in Table 7 indicated positive, significant relationship between farming income and rice growers' attitudes toward water and soil conservation (r=0.112) at the 95% confidence level. Since the coefficient of correlation is low, it should be interpreted discreetly because it might have become significant because of high sample size. In addition, rice growers' attitudes towards water and soil conservation showed negative, significant relationship with the number of family members (r=−0.132), rice production regardless of cultivated area (r=−0.290), land size (r=−0.214) and village distance to main road (r=−0.352) at the 99% confidence level (Table 7).

The correlation between ordinal variables was estimated by the Spearman test. Results in Table 7 revealed a positive, significant relationship between rice growers' educational level and their attitudes towards water and soil conservation at the 99% confidence level (r=0.204).

3.3. Stepwise multiple linear regression

Prior to stepwise regression analysis, the collinearity among independent variables and the independence among errors were tested. The collinearity between independent variables was tested by the value of tolerance and variance inflation factor (VIF). The higher the tolerance is, the more the information about variables is, implying that there is no problem to use regression (O'brien, 2007; Rogge, Evens & Gulinck, 2007). Durbin-Watson value shows the indepen-

Table 8
Stepwise multiple regression for predicting rice growers' attitudes towards water and soil conservation.

Variables	Nonstandard coefficient		Standardized coefficients	t	p-value	Tolerance	VIF
	B	Standard error	Beta				
Constant	4.042	0.098		41.389	0.000		
Village distance to main road	−0.126	0.024	−0.250	−5.220	0.000	0.853	1.173
Rice production rate	0.000	0.000	−0.269	−7.939	0.000	0.658	1.520
Number of farms	0.055	0.015	0.192	3.710	0.000	0.731	1.367
Educational level	0.133	0.034	0.176	3.915	0.000	0.943	1.060
Farming annual income	−0.000	0.000	−0.131	−2.794	0.005	0.882	1.134

dence of the errors. It is a number in the range of 0–4 and the value of 1.5–2.5 shows the lack of correlation between errors (Greene, 2002; Nerlove & Wallis, 1966). Tolerance value of less than 0.1 interrupts the use of regression. In case the tolerance value is less than 0.2, the collinearity is likely. The highest tolerance was 0.943 and the lowest one was 0.658 in the present study. Since the tolerance value of no variables studied in the regression model was less than 0.2, it can be concluded that the variables were not collinear (Table 8). The lower the VIF value, the lower the variance of regression coefficients. Then, regression becomes more suitable for prediction. VIF value varies in the range of 0–10. If VIF > 10, then collinearity is likely. In the present study, the lowest VIF value of the variables was 1.060 and the highest one was 1.520. Since VIF value of neither variables was > 10 in the regression model, it can be concluded that the variables were not collinear (Table 8). The Durbin-Watson value was 1.535 in the present study implying that there was no correlation between errors. So, it was possible to use regression. It should be noted that independent variables included in regression were the ones with a significant relationship with a dependent variable in the analysis sector. Also, the correlations between independent variables which were less than 0.8 were included in the regression equation to hinder the collinearity effect between independent variables.

The estimation of the role of variables on the prediction of attitudes towards water and soil conservation showed that 23.1% of variance of the attitudes could be determined by a linear combination of variables included in the regression equation. The variables 'village distance to main road', 'rice production rate', 'farm number', 'educational level', and 'farming income' had a significant influence ($p < 0.01$) on determining the attitudes towards water and soil conservation. However, beta values should be used to estimate the relative importance of independent variables in the prediction of the regression equation.

Beta values show the relative importance of independent variables in determining the dependent variable. Results of beta values exhibited that rice production rate (β=- 0.269) was the most effective variable on rice growers' attitudes towards water and soil conservation. The next most effective variables were found to be village distance to main road (β=-0.250) educational level (β=0.176), number of farms (β=0.192) and farming income (β=- 0.131) (Table 8).

4. Conclusion and recommendations

If farmers increase their irrigation efficiency through conservation practices then their irrigation security would be enhanced. Although the need for water conservation is recognized worldwide, there appears to be very little published work concerning water conservation practices in Asia overall, and in Iran, in particular. The careful management and efficient use of water is a crucial component of any governmental plan of action designed to conserve resources. Thus, appropriate technologies and policies are needed to prepare for potential and expected water shortages (Jara-Rojas et al., 2013).

The objective of this paper was to understand small-scale farmers' attitudes towards water and soil conservation. The results could help to improve the understanding of farmers' behavior regarding conservation, and therefore help the development of incentives and/or instruments focusing on soil and water programs. More generally, the analysis will help to fill the gap that exits in the literature concerning the drivers of adoption of conservation in the country.

It was revealed that most studied rice growers had positive attitudes towards water and soil conservation. The attitude level of 44.8% and 41.2% of rice growers was evaluated to be good and moderate, respectively; it implies their interest for fulfilling water and soil conservation practices in their farms. It means that financial investments on water and soil conservation plans and the development of supportive programs for conservation plans can encourage rice growers to adopt them. Pannell (1999) relates low level of the adoption of conservation technologies by farmers to their negative attitude towards conservation and sustainability. Therefore, it is recommended to financially invest in water and soil conservation plans and to develop supportive programs for water and soil conservation plans in order to enhance positive attitude among farmers and foster their interest to fulfill water and soil conservation practices. Research shows that there is positive, significant relationship between rice growers' attitude towards water and soil conservation practices and the adoption of these practices (Asaful-Ajdaye, 2008; Ghorbani, 2009; Karimi & Chizari, 2007; Kayongo & Mbithi, 1979; Kessler, 2006; Mahboubi, Irvani, Rezvanfar, Kalantari & Mohseni Saravi, 2005; Nasiri, Najafinejad, Darijani & Saadodin, 2011; Nkegbe, Shankar & Ceddia, 2011; Sain & Barreto, 1996; Shafiee et al., 2008; Tenge, de Graaff & Hella, 2004). In other words, the more positive the rice growers' attitude towards water and soil conservation, the higher their contribution in water and soil practices to conserve basic farming resources and avoid their degradation. In addition, farmers who better understand the problem of soil erosion are expected to invest more on the conservation of resources. Attitude towards water and soil conservation showed no significant relationship with the adoption of water and soil conservation practices in Mengstie (2009), Amsalu and de Graaff (2007) and Anley, Bogale, and Haile-Gabriel (2007).

Results show that local farmers rarely use communicative channels and information sources. Given the farmers' low score in the use of communicative channels on the one hand and the positive, significant effect of the use of these channels and information sources on the generation and growth of positive attitudes towards water and soil conservation on the other hand, it is recommended to improve farmers' access to communicative channels and information sources and to strengthen farmers' contact with colleagues, extensionists, developers and other communicative sources and channels. It will increase their awareness and knowledge of modern technologies of water and soil conservation on the basis of their actual needs.

A Positive, significant relationship was found between farming income and rice growers' attitude towards water and soil conservation. In addition, rice growers' attitude was negatively and significantly related to family size, rice production rate regardless of cultivation area, land size, and village distance to main road. There was a positive, significant relationship between rice growers' educational level and their attitude towards water and soil conservation at the 99% confidence level. The examination of variables' role in predicting attitude towards water and soil conservation indicated that 23.1% of variance in attitude could be determined with a linear combination of variables included in regression equation. The variables which had significant influences ($p < 0.01$) on determining attitude towards water and soil conservation included village distance to main road, rice production rate, the number of lands, educational level and farming income.

Village distance to main road (r =0.352) had a reverse relation with rice growers' attitude toward water and soil conservation so that the lower the distance to the main road, the more positive the rice growers' attitude towards water and soil conservation. In other words, more distant farmers from main road attempt harder to protect their basic farming resources. Mengstie (2009) and Lapar and Pandey (1999) stated that longer distance of house to farms was a factor that reduced the adoption and that house distance to main road was longer in non-adopters than in adopters of soil conservation practices. It is, also, in disagreement with Chomba (2004) who found that distance to main road had positive, significant impact on the adoption of water and soil conservation practices.

The positive, significant relationship between farming income and attitude towards water and soil conservation reveals the importance of farming income on farmers' positive attitude to the protection of basic farming resources. The higher the rice growers' income from farming is, the more extensive their attempts are to protect basic resources.

Family size had a negative, significant relationship with attitude toward water and soil conservation (r=−0.132). Bakhsh, Hassan, Khurshid, and Hassan (2012), Mengstie (2009) and Bekele (2003) found negative, significant relationship between family size and the adoption of conservation practices which can be related to the fact that as family size grows, farmers may have lower financial resources to hire workers for fulfilling conservation technologies. Jara-Rojas et al. (2013) and Nkegbe et al. (2011) showed that family size had a positive, significant relationship with the adoption of conservation practices which may be evidence supporting the hypothesis that as family workforce increases, it is more likely for the farmer to adopt water and soil conservation practices. In Amsalu and de Graaff (2007); Amsalu (2006) and Posthumus (2005) and Rezvanfar, Samiee, and Faham (2009), family size did not affect the adoption of soil conservation practices significantly.

Rice growers' educational level had a positive, significant relationship with their attitude towards water and soil conservation showing that as their educational level increases, they have more positive attitude towards water and soil conservation and attempt harder to protect these resources. In addition, it can be associated with the fact that farmers with higher educational level are more informed of the advantages of water and soil conservation and so, they are more inclined to adopt these practices. This finding is in agreement with Anley et al. (2007), Illukpitiya and Gopalakrishnan (2004), Mengstie (2009), Kessler (2006); Lapar and Pandey (1999); Pender and Kerr (1998), Rezvanfar et al. (2009), Tenge et al. (2004); whilst Chomba (2004), Foltz (2003), Jara-Rojas et al. (2013), Nkegbe et al. (2011) and Posthumus (2005) showed that educational level had no significant relationship with the adoption of conservation practices.

The results also imply that since the poorest farmers are those least likely to adopt water conservation practices, these farmers need special attention when policies are designed to promote adoption of the types of techniques and technologies analyzed in this study. An important implication is the need to create education and technical assistance programs that encourage farmers to adopt these practices regardless of their economic standing. Moreover, extension, social capital and water investment incentives can be effective instruments not only for increasing water conservation but also for reducing rural poverty, especially in small farms that depend on spillover water (Jara-Rojas et al., 2013).

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