



Farmers' Perceptions on Payment for Ecosystem Services Scheme in Uluguru Mountains, Tanzania

Lazaro Kagata¹, Felister Mombo² and Fatihiya A. Massawe³

¹Department of Development and Strategic Studies, College of Social Sciences and Humanities,

The Sokoine University of Agriculture, P.O. Box 3024, Morogoro, Tanzania. Email: lazakagata@gmail.com

² Department of Forest and Environmental Economics, College of Forest, Wildlife and Tourism, Sokoine University of Agriculture, P.O Box 3011, Morogoro, Tanzania, East Africa. Email: fnombo@yahoo.com

³Department of Policy, Planning and Management, College of Social Sciences and Humanities, Sokoine University of Agriculture, P.O Box 3035, Morogoro, Tanzania. Email: mnkya74@gmail.com

Received: April 13, 2021; Accepted: November 12, 2021; Published: December 15, 2021

Abstract: The payment for ecosystem services (PES) scheme is viewed as a market-based approach to environmental management that compensates land stewards for ecosystem conservation and restoration in developing countries. Farmers' perceptions were expected to influence the success of the adoption of the PES scheme land use interventions. While farmers' perception of the adoption of PES has always been considered important, it is not empirically known what kind of perceptions farmers have of the PES scheme. This article assesses farmers' perceptions of the PES scheme in Kibungo Juu ward, Morogoro Rural District, Tanzania. Specifically, this paper established levels of perceptions of the PES scheme among farmers and examined factors that determined farmers' perceptions of the PES scheme. A simple random sampling technique was used to obtain 219 households for the survey. A 5-point Likert scale was employed to gauge the perception of the PES scheme. The data were analysed using IBM-SPSS software. Descriptive statistical analysis and ordinal logistic regression model were used to determine levels of perceptions among farmers and examined the factors that influence farmers' perceptions toward PES respectively. Results show that 48% of the respondents had a positive perception of the scheme, while 32% had a negative perception and 20% had a neutral perception of the scheme. Age, level of education and farmers' fear of the long term aim of the PES scheme were statistically significant with $p=0.000$, $p=0.005$ and $p=0.016$ respectively in determining farmers' perceptions toward the PES scheme. It can be observed that a significant proportion of farmers had a positive perception of PES. Also, older farmers with high levels of education feared the long term aim of the PES scheme; hence their perceptions influenced the adoption of the PES scheme. Therefore, given the positive perception of the majority, the study recommends the upscaling the PES scheme to other areas of ecosystem degradation.

Keywords: Perception, interventions, ecosystem services, payments for ecosystem services, watersheds.

1.0 Introduction

The land is a primary asset for the development of most rural people. Land is not only a source of livelihood; it also carries a valuable economic asset (Kironde, 2012). The land is usually managed for private benefit, because land managers, in this case, the poor, marginal landowners and users will always convert their land to alternative uses such as agriculture rather than maintain it in its natural state (WWF, 2008). However, there is a growing interest across the globe, in creating incentive measures for managing natural resources, and addressing livelihood issues for the rural poor, in the body of literature e.g (WWF, 2008; Malimbwi and Ngaga, 2005; Kaczan *et al.*, 2011; Mombo *et al.*, 2013) providing sustainable financing for protected areas.

It is understood that human beings depend on ecosystem services, and the protection of these services in infinity is of crucial importance in economic and social development. The ecosystems that have supported human development over the centuries are changing rapidly. The current experience of degradation in the health of some of these ecosystems is so severe that it is approaching a point where recovery will be difficult, expensive and time-consuming (GEF, 2014). It is from this context that Payments for Ecosystem Services (PES) is currently being regarded as one of the most promising tools in environmental and sustainable governance (Nicolaus and Jetzkowitz, 2014). Therefore, from a theoretical perspective, PES is viewed as one of the measures undertaken by environmental scientists to manage ecosystems.



A study conducted by Kisaka and Obi (2015) reveals that PES underlies the assumption that, to maintain the flow of environmental goods and services for societies, incentives are needed to induce people to employ practices that are friendly to land use. This approach is embedded in the anthropocentric concept that land-use changes will be detrimental to human existence, life forms and environments on earth for which human beings are stewards (Ajayi, 2007). Since the management of ecosystems has cost implications, it is expected that the use of the PES scheme can reduce such costs (Bruner and Reid, 2015; Cassola, 2010). It is because farmers are provided with incentives in terms of financial and material support to implement the promoted interventions.

Since the success of the PES scheme and its associated ecosystem conservation measures depend on farmers' perception of its suitability in comparison with the current practices, then it is important to assess perceptions among farmers on the PES scheme. A few studies focusing on the PES scheme have been conducted in Tanzania. A study by John (2012) for instance focused on how the successful PES scheme has improved livelihood while a study by Mombo *et al.* (2013) focused on introducing the PES scheme as a strategy to reduce deforestation in the Kilombero wetlands catchment area. In the entire reviewed literature, the PES scheme is seen as a recent approach and promising initiative for ecosystem conservation and also for the future generation. However, the literature does not inform how farmers perceive the PES schemes in their localities. Further to this, it is not empirically known the factors that influence their perceptions of the scheme. Therefore, this paper fills the knowledge gap by examining perceptions among farmers towards the PES scheme in the Uluguru Mountains, Tanzania. The paper established levels of perceptions of the PES schemes among farmers and examined factors that determined farmers' perceptions of the PES scheme. Generally, farmers' perception of PES varies across regions due to differences in the backgrounds of particular communities (Chen *et al.*, 2017). Understanding levels of perceptions among farmers and associated factors that may enhance farmers' ability to adopt improved farming and management practices can be enhanced. This research creates an opportunity for scholars, practitioners, and farmers to identify and utilize appropriate management strategies relevant to the local context. Further to this, the information on farmers' perceptions of the PES scheme will provide evidence on possibilities or future up-scaling of the PES scheme in other parts of Tanzania with similar challenges like those of Uluguru Mountains, Tanzania. This is also expected to inform PES scheme promoters on farmer perception to design a strategy to change farmers' perceptions for successful PES implementation.

2.0 Theoretical and Conceptual Framework

2.1 Theoretical Framework

The theoretical framework of this study is based on the main objective of the PES scheme which is to influence farmers to abandon their traditional farming. This has always been expected to lead to high land degradation and adopt new land-use interventions which not only enhance the farming system and ecosystem management but also soil fertility necessary for crop production. Therefore, this study draws on the general theory of change (TOC). This theory guides the assess the ment of the PES scheme's impact on crop production. The TOC provides evidence for farmers to realise benefits from PES scheme land-use interventions through different pathways: (i) adoption of land use interventions and (ii) crop production increase. The incentives attached to the PES scheme act as drivers for behaviour change among farmers. The TOC is relevant for explaining the influence of incentives and other benefits accrued in changing farmers' behaviour and leads to a chain of reanresultss including ng increase in crop production as well as managing ecosystems.

2.2 Conceptual Framework

The conceptual framework of the study (Figure 2.1) is built on the general TOC. It illustrates how farming practices, age of the farmer, education level, extension services and PES scheme influence changes in farmers' perceptions. According to Weiss (1995), the TOC is a theory of how and why an initiative works; but for its intended impacts or results to occur it involves exploring a set of beliefs or assumptions about how changes will occur (Stein and Valters, 2012). Therefore, this study draws on this theory to explain how factors like age are likely to influence farmers' beliefs towards the PES scheme's newly introduced farming practices based on the fact that they had their traditional farming practices which are associated with farming experiences. It further explains how education level relates to the farmers' level of awareness of the PES scheme hence influencing their perceptions of the innovations of the PES scheme. In this regard, extension services play an important role in increasing farmers' level of awareness through training and hence high/low rate of acceptability of the innovation.

PES scheme assumed that for farmers to adopt the new land-use interventions provisions of incentives in terms of financial and materials support are an important tool. However, based on the TOC exploring farmers' beliefs or assumptions about the incentives provided is inevitable because it has the powerinflateuthe ence the why positive or negative perceptions among farmers. Therefore, this conceptual framework gives a road map to understanding how farmers' characteristics and external factors influence farmers' perceptions of the PES scheme and seek to



understanders whether farmers have positive or negative perceptions of the scheme.

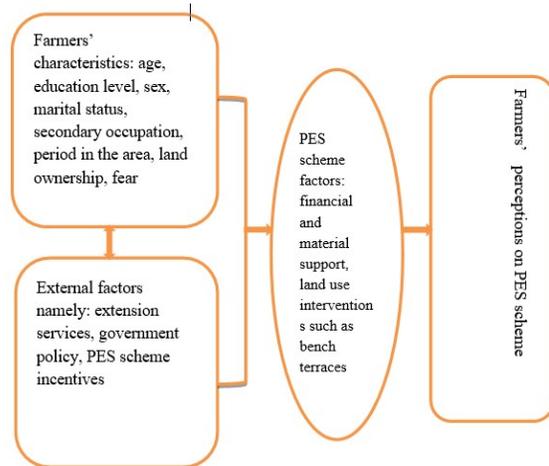


Figure 1: Conceptual framework on farmers' perceptions of the PES scheme

3.0 Methodology

The study was conducted at Kibungo Juu Ward in Morogoro Rural District, Morogoro Region, Tanzania. The study area is located about 200 km west of Dar es Salaam, Tanzania. The Uluguru Mountains' altitude ranges from 300 to 2 638 m above sea level (CARE and WWF, 2007). This area was selected because the PES scheme was piloted there to conserve watersheds as well as improve the livelihood of the rural people through increased crop production. A cross-sectional research design was employed to collect data from March 2016 to June 2016.

A total of 219 households were randomly selected from a list of all households in all randomly selected villages, namely Lanzi (n = 69), Nyingwa (n = 90) and Lukenge (n = 60) obtained proportionally based on the number of households in the village. The key informants namely Village Executive Officers, Ward Executive Officers, Extension Officers and members of farmer groups were purposively selected because they were among key participants involved in the early stage of the PES scheme implementation. Data were collected through Focus Group Discussions (FGDs) and Key informant interviews which involved seven (07) key informants from each village whereby participants in FGDs were people with particular knowledge of PES the heme. A purposive sampling approach was used to obtain participants in the FGDs. Two FGDs were carried out per village whereby the number of participants in an FGD ranged from seven to eight.

A five-point Likert scale, as indicated in Table 2.1, was used to measure the perceptions of farmers toward the PES scheme. A total of 14 statements were included in the scale and the respondents were required to indicate their level of

agreement or disagreement with each of the statements. Half of the statements on the scale had positive connotations while the other statements had negative connotations. There were five alternative responses to each of the statements: strongly disagree (1 point), disagree (2 points), undecided (3 points), agree (4 points) and strongly agree (5 points) The minimum of 14 scores was obtained if one selected strongly disagree for all the 14 statements both negative and negative connotations. A maximum of 70 scores was obtained if one selected strongly agree with all the 14 statements. A score from 35 to 42 would indicate a neutral perception of PES. In this study, any score greater than or equal to 14 but less than 35 scores represented negative; any score greater than 42 but not exceeding 70 scores representel've'vea ivl'veerception of PES. Based on the index scores, the respondents were categorized into three levels of perception: negative, neutral and positive as shown in Table 1.

Table 1: Scores and level of perception from a five-point Likert scale with 14 statements

Total score	Level of perception
14 - 34	Negative perception
35-42	Neutral perception
43 - 70	Positive perception

Ordinal logistic regression was used to analyse factors that determine farmers' perception of PES. This is because the response variable was measured in three nominal categories, namely positive, neutral and negative perception (Wesbard and Britt, 2014). The assumptions of ordinal regression require: first the response variable which is measured on an ordinal level, and one or more of the predictor variables are continuous, categorical or ordinal. Secondly, there should be no multi-collinearity which means that there should be no two or more predictor variables which are highly correlated with each other and thirdly there must be proportional odds which means that each response variable has an identical effect at each cumulative split of the ordinal response variable.

The model analysis involved Wald statistics and a significant level of p values at 5%. The coefficient value bears a negative or positive sign implying the negative or positive impact on the chances of the higher category in shaping perception. The Wald statistics were used to assess the contribution of the proprietor to r the outcome. If the variable is significant at a p-value less or equal to 5%, then the predictor is making a significant contribution to the prediction of the response variable (Weisburd and Britt, 2014).

$$P(Y) = \frac{e^{\alpha + \beta_1 X_1 + \dots + \beta_k X_k}}{1 + e^{\alpha + \beta_1 X_1 + \dots + \beta_k X_k}}$$

Where:

P(Y) = the probability of occurring (positive, negative or neutral perception), e = the natural log, α = the intercept of the equation, β₁ to β_k = coefficients of the predictor variables, X₁ to X_k = predictor variables entered in the ordinal regression model (Table 2), and Y = outcome (response



variable).

Table 2: The variables used in the ordinal logistic regression equation

Symbol of Explanatory Variables	Explanatory Variables	Explanation i.e. the probability of respondents being grouped (1 = negative, 2 = neutral, 3 = positive)
X ₁	Sex of the household head	1= Male, 0 =Female
X ₂	Age of the household head	Age in years
X ₃	Education level of the household head	Years of schooling
X ₄	Secondary occupation of the household head	1 if employed in the formal sector,0 otherwise
X ₅	Access to extension service	1 = Yes, 0 = No
X ₆	Extra labour demand in a household	1 if demand extra labour, 0 otherwise
X ₇	PES incentives	1 if accessed incentives, 0 otherwise
X ₈	The title deed of land right ownership by the household	1 if available, 0 otherwise
X ₉	Period the household head lived in the same area	period in years
X ₁₀	Marital status of the household head	1 if married, 0 otherwise
X ₁₁	Farmers fear the long term aim of PES	1 if feared, 0 otherwise

Qualitative data were analysed through content analysis whereby the information was categorized into themes and sub-themes according to the specific objectives. For example transcription of recorded data and compressing into fewer content categories resulting in synthesized meaning based on study objectives.

4.0 Results and Discussion

4.1 Socio-demographic characteristics

The results indicate that 40% of the respondents were aged from 46 to 60 years. In farming activities, the age composition of farmers plays a very significant role as it influences farmers' perceptions either positive or negative. For example, Akudugu *et al.* (2012) revealed that age is said to be a primary latent characteristic in adoption decisions. Thus age is an important factor for this study because it can influence positive or negative farmers' perceptions of practice. However, there is debate on the direction of the influence of age on perception where it is assumed that at a younger age people are more receptive to new ideas and practices, whereas at an advanced stage, people find it difficult to change practices.

Further to this, the educational status of respondents shows that more than half of the respondents had formal education as reflected in Table 3. It is a good sign as it indicates that

education is gaining importance among the respondents. Moreover, the educated members also vary in their category of education ranging from primary to form four education levels. Education is thought to create a favourable mental attitude for the acceptance of new practices (Waller, 1998; Caswell, 2001).

These factors are important in determining farmers' perceptions as pointed out by various scholars such as Ervin and Ervin (1982) who argue that farmers' characteristics such as age and education play a critical role in framing their perceptions towards Pofers (1995), in his theory, identified farmers' socioeconomic characteristics as key variables which affect the process of decision making before accepting or rejecting a new idea or an innovation. Results further revealed that all respondents depended on agriculture as their main economic activity, but about 80% were engaged in informal employment as their secondary occupation. John (2012) also pointed out that the main activity of communities in the Uluguru Mountains is agriculture.

The results further revealed a scarcity of household labour force for some land use interventions such as bench terrace farming, especially when it is provided by the same household. More than half of farming households (about 56%) reported to having two people who could actively engage in farming. This is an important aspect for determining farmers' perceptions because some farming households depend solely on household labour with limited capacity to hire extra labour during farming the season. For example, more than ten people are required to construct a normal bench terrace of size 20 m by 5 m (Kagata *et al.*, 2018). Households with such a small number of the labour force may have a negative perception of bench terraces ringing when responding to the PES scheme.

Table 3: Socio-demographic characteristics (n= 219)

Variable	Category	Frequency	Percent
Age group in years	30 -45	55	25.1
	46 - 60	88	40.2
Sex	61 +	76	34.7
	Female	90	41.1
	Male	129	58.9
Marital status	Unmarried	84	38.4
	Married	135	61.6
Education level	No formal education	48	21.9
	Std four	33	15.1
	Std seven	109	49.8
	Std eight	16	7.3
	Form two	7	3.2
	Form four	6	2.7
Household workforce	1	72	32.9
	2	123	56.2
	3 and above	24	11
Secondary occupation	Informal employment	177	80.8
	Formal employment	42	19.2
Primary occupation	Agriculture	219	100.0



4.2 Perceptions of PES scheme among farmers

Table 4 reveals that 96.5% of the respondents were satisfied with The PES scheme in general while 72.6% were not satisfied with its implementation mechanism. Further to this, about 64.8% of farmers were not satisfied with the incentives in terms of financial support. Furthermore, it can be seen that the highest means (4.42 and 4.43, 4.44) were obtained on five statements. These statements are technical and financial support are key factors for implementing the PES scheme; PES scheme stimulated my engagement in farming; PES scheme is not a plan of the government to farmers' land, I need land property right to implement PES scheme; I can implement PES scheme without agricultural extension services; and I was satisfied with land use interventions promoted by the PES scheme. The overall perception score for the positive connotation was calculated by taking the average of all the responses to 3.64 and a standard deviation of 0.897. This can be regarded as a positive perception to the PES scheme (3.64 out of a possible 5), while the relatively small standard deviation showed small variability among the farmers.

Results further revealed that, overall, 47.9% of the respondents had a positive perception of the PES scheme compared to 31.5% of the respondents who had negative perception, and 20.5% of them had a neutral perception towards the PES scheme. This means that some farmers had a negative perception to implement the PES scheme because of various reasons. These reasons included farmers who were not sure of the long term aim of the scheme. This scenario was revealed during the FGDs whereby, through the use of different meetings and seminars held in the area, it helped farmers to make them understand the long term aim of the PES scheme. For example, in one of the FGD participants from Lanzi Village, it was revealed that:

“Through meetings and seminars, we were able to understand the long term aim of PES which was to improve farmers’ living standard through farming and not taking our land” (FGD with farmers at Lanzi, 29th March 2016)

Table 4: Levels of Farmers’ Perception towards PES Scheme (n= 219)

Perception statements	Strongly Disagree (%)	Disagree (%)	Undecided (%)	Agree (%)	Strongly agree (%)	Mean	Standard deviation
Technical and financial support is key factors for implementing the PES scheme	0.0	3.7	0.0	45.7	50.7	4.43	0.683
Interventions							
PES stimulated my engagement in farming	0.0	2.7	0.9	46.6	49.8	4.43	0.656
PES scheme increased crop production	0.5	10	2.3	45.7	47.9	3.69	1.064
PES scheme is not a plan of the government to grab farmers’ land	0.5	2.7	0.0	47	49.8	4.43	0.683
Any farmer can implement the interventions promoted	8.2	64.4	2.3	23.3	1.8	2.48	1.020
I need land property rights to implement PES	0.0	2.7	1.4	47	48.9	4.42	0.661
I can continue without compensation	16	32.4	0	25.6	26	3.13	1.501
I can implement the PES scheme without agricultural extension services	0.0	2.7	0.9	46.1	50.2	4.44	0.658
The PES scheme was meant for all farmers in my village	7.8	10		69.9	12.3	4.37	0.745
I need a formal education level to implement PES scheme	7.8	63.5	5.9	21.5	1.4	2.45	0.958
Land use interventions are labour intensive	0.0	4.1	1.8	45.7	48.4	4.38	0.722
I was Satisfied with the financial support provided by the PES scheme	7.8	64.8	1.8	23.7	1.8	2.47	0.997
I was Satisfied with the PES scheme implementation	8.2	64.4	2.3	23.3	1.8	2.46	0.996
I was Satisfied with land use interventions promoted by PES	0.0	3.2	0.0	47.9	48.9	4.42	0.662
Overall farmers’ perceptions							
Level of farmers’ perceptions				Score	Frequency		Percent
Negative perception				14 - 34	69		31.5
Neutral perception				35 - 42	45		20.5
Positive perception				43 - 70	105		47.9
Total					219		100

Mean = 3.86 calculated from scores on a five-point scale



It means that training farmers through various ways such as meetings and seminars are important components which can make any technology or practice successful. This is in line with Lugandu (2013) who argues that farmers' perceptions may be influenced by the information available to them, their

socioeconomic situation and farming initiatives. Further to this, communication between farmers and other interventionists is important because development of more appropriate technologies may change perceptions among farmers (Desbiez *et al.*, 2004).

I.

4.3 Determinants of farmers' perception of PES scheme

Based on the nature of the innovation, where one of the land-use interventions such as tree planting on their farms, some farmers predicted the future outcome will include their farms in the conservation area. This is because the study area is closer to the watershed conservation area; they thought that the PES scheme's long term aim was to include their land in the conservation area. Furthermore, since PES scheme interventions refocused on farming, it was not much of an area of interest to some farmers. However, Sterling (2004) argues that training aims at correcting the behaviour of people by giving them the appropriate knowledge about the technology or practice. This may make farmers develop positive perceptions about the promoted practice. In the same line, education is thought to create a favourable mental attitude for the acceptance of new practices, especially information-intensive and management-intensive practices (Waller *et al.*, 1998; Caswell *et al.*, 2001).

The age of the farmer (Table 5) was found to be statistically significant ($p \leq 0.05$), but negatively determined farmers' perceptions of the PES scheme. Land-use interventions promoted by the PES scheme intended to offer short and long term benefits to farmers. For example, the intervention like bench terraces would increase crop production within the season hence farmers realise the short term benefits. Other interventions like tree planting cannot offer short term benefits to farmers hence discouraging old age farmers to accept them hence promoting a negative attitude. Further to this, as the age of the farmer increases, the farming labour production decreases; hence they become less interested in technologies or practices that are labour intensive. For example one of the FGD participants at Lanzi village said:

"Farmers with younger age have a good chance to implement the interventions promoted such as bench terrace farming". (FGD with farmers at Lanzi, 29th March 2016)

This was supported by other group participants. Further to this, a key informant in Lanzi village said that:

"Some farmers of older age were reluctant to implement the interventions such as bench terraces because they are labour intensive"

It means that for the agricultural practices which are new to farmers, the young ones are likely to have positive

perceptions as opposed to the older ones. This is in line with a study by Nyanga (2012) who revealed that older farmers are accustomed to conventional methods of farming and hence are unlikely to change their farming behaviour. These findings are also in line with those of Young *et al.* (1990), Ajayi (2007) and Angelova and Zekiri (2011) who argue that farmers' perception of a new practice is determined by the age of the farmer. Other studies have shown that younger farmers are more receptive than older ones as the latter are not always ready to part with the old techniques for new ones (Nmadu, Sallawu, and Omojeso, 2015). In contrast, age has been negatively correlated with perception or is not significant (Baidu-Forson, 1999). These variations are influenced by the nature of the practice of technology as well as farmer characteristics.

Table 5: Determinants of farmers' perception of PES scheme (n = 219)

Factors	Estimate (β)	Std Error (SE)	Wald	df	Sig.
Age	-0.053	0.015	12.706	1	0.000**
Education level	-0.120	0.043	7.797	1	0.005**
Years of living in the same village	0.027	0.015	3.242	1	0.072
Sex	-0.202	0.346	.340	1	0.560
Farmers fear the long term aim of the PES scheme	-0.656	0.273	5.764	1	0.016**
Agricultural extension services	-0.277	0.297	0.873	1	0.350
Marital status of the household head	-0.300	0.335	0.802	1	0.370
Land right ownership	0.346	0.364	0.902	1	0.342
PES scheme incentives	-0.252	0.271	0.870	1	0.351
Secondary occupation of the household head	-0.497	0.351	2.003	1	0.157
Extra labour demand	0.170	0.406	0.175	1	0.676

Model fitting information: Cox and Snell $R^2 = 0.123$, Nagelkerke $R^2 = 0.14$. ($p = 0.003$);

****denote significance at 5% level**

Farmers' fear of the overall long term aim of the PES scheme was statistically significant but negatively determined farmers' perceptions toward the PES scheme. This means that some farmers were worried that it is the means of the government to grab their land. This was attributed to the fact that the study area is closer to the source of River Ruvu which is under the government conservation project; therefore leading to the thought that in the future the Government would include their mind in the conservation area. This state of fear was discussed in one of the FGD by participants from Nyingwa village area where one of the participants revealed that:

"Some of us were not sure of the Government plan that is why we did not rush to implement the PES scheme" (FGD with farmers at Nyingwa, 11st April 2016).

This implies that awareness for farmers is important as it motivates and creates a positive perception towards innovation because through awareness campaigns



farmers to gain information on the benefits of new technology. One of the key informants from Nyingwa village said that:

“Some farmers thought the Government plan was to make their land as part of conservation area because they are closer to this area”

This means that adopting land use interventions such as planting trees could be to facilitate the government campaign and plan to expand the watershed conservation area. This is in line with a study by Bwambale (2015) who revealed that farmers would like to try out practice before adoption because most farmers are risk-oversee and would like to select practices or technology which is beneficial to them.

5.0 Conclusion and Recommendations

From the study findings, it can be concluded that the overall farmers' perception of the scheme is positive implying that the PES scheme interventions are regarded to be better compared to the previous initiatives. Further to this, the perceptions of farmers towards the PES scheme are associated with the adoption of the land use interventions promoted by the scheme, which implies that efforts to change the farmers' negative perception of the scheme will increase the adoption of the land use interventions. This is because the existence of negative perceptions among farmers may lead to rejection of farming practices during the early stages of implementation. The findings are in line with the TOC because the incentives and benefits obtained managed to change farmers' farming practices and ultimately increase production.

Therefore, it is recommended that PES scheme promoters need to take into account the farmers' characteristics when promoting any innovation because of their different needs. A shared vision among the researchers, agricultural extension personnel, farmers and polipolicymakers help to develop positive perceptions of PEofscheme. In this case, a package of training that accommodates younger and older farmers, as well as farmers with different formal education levels, is needed to develop p positive perceptofards Pthe ES scheme. Further studies need to be conducted that can study the schemesmethe and adoption of land use interventions promoted. This would help disclose the current status of adoption of interventions promoted by PES which was not done in this study.

References

Ajayi, O.C. (2007). User acceptability of sustainable soil fertility technologies: lessons from farmers' knowledge, attitude and practice in southern Africa. *Journal of Sustainable Agriculture* 30 (3): 21 - 40.

Angelova, B. and Zekiri, J. (2011). Measuring Customer Satisfaction with Service Quality Using American Customer Satisfaction Model (ACSI Model), *International Journal of Academic Research in Business and Social Sciences* 1(3): 232 – 258.

Baidu, F.J. (1999). Factors Influencing Adoption of Land-Enhancing Technology in the Sahel: Lessons from a Case Study in Niger. *Agricultural Economics* 20: 231-239.

Bailey, D.K. (1998). *Methods of Social Research*. Collier Macmillan Publishers, London. 478pp.

Borges, J.A.R., Foletto, L. and Xaviers, V.T. (2015). An interdisciplinary framework to study farmers' decisions on adoption of innovation: Insights from Expected Utility Theory and Theory of Planned Behavior in Brazil. *African Journal of Agricultural Research* 10(29): 2814-2825.

Bruner, A. and Reid, J. (2015). *Behavioral economics and payments for ecosystem services: finally some free lunches*. Discussion paper No.13.16pp.

Bwambale, N. (2015). Farmers' Knowledge, Perceptions, and Socioeconomic Factors Influencing Decision Making For Integrated Soil Fertility Management Practices in Masaka and Rakai Districts, Central Uganda. Thesis for Award Degree of a doctorate at Lowa State University Digital Repository. 99pp.

CARE and WWF (2008). *A household survey was conducted in Kibungo sub-catchments*.

Cassola, R. (2010). TEEB case: Payments and technical support for reforestation and soil conservation for watershed protection, Brazil, mainly based on VeigaNeto, F. (2008), (TEEBweb.org.) sited on 10th, April 2018.

Chen, Y., Zhang, Q., Liu, W. and Yu, Z. (2017). Analyzing Farmers' Perceptions of Ecosystem Services and PES Schemes within Agricultural Landscapes in County, China: Transforming Trade-Offs into Synergies. *Journal of Sustainability* 9: 1-18.

Ervin, C.A. and Ervin, D.E. (1982). Factors affecting the use of soil conservation practices: hypotheses, evidence, and policy implications. *Land economics* 58 (30): 277-292.

Global Environmental Facility (2014). Payment for Ecosystem Services Schemes. pp24.

Greiber, T. (Ed) (2009). *Payments for Ecosystem Services*. Legal and Institutional Frameworks. IUCN, Gland, Switzerland. xvi .296 pp.

Hejnowicz, A., Raffaelli, D.G., Rudd, M. and White, P.C.L. (2014). Evaluating the outcomes of payments for ecosystem services programmes using a capital asset framework. *Journal of Ecosystem Services* 9 (1): 83-97.

IFAD (2013). *Smallholders, food security, and the environment, United Nations Environment Programme*. 56 pp.

John, I. (2012). *How successful has Payment for Environmental Services improved welfare? The Case of Uluguru Mountain, Morogoro*. Dissertation for award of a Degree of M.A



- (Economics) at University of Dar es Salaam. 99 pp.
- Kaczan, D., Swallow, B. and Adamowicz, V. (2011). Payment for Ecosystem Services (PES) program design in Tanzania: Farmers' preferences for enforcement and payment options. Paper presented at Agricultural & Applied Economics Association Joint Annual Meeting, Pittsburgh.
- Kagata, L., Mombo, F. and Massawe, F.A. (2018). Payments for Ecosystem Services Incentives and Adoption of Land Use Interventions in Uluguru Mountains, Tanzania. *Agricultural Sciences* 9: 299-316.
- Kironde, J.M.L. (2012). *Natural Resources and Conflict Management: The case of Land* Ad hoc Expert Meeting (AEGM), Dar es Salaam, Tanzania. *Economic Commission for Africa* 14-15pp.
- Kisaka, L. and Obi, A. (2015). Farmers' Preferences for Management Options as Payment for Environmental Services Scheme. *International Food and Agribusiness Management Review* 18(3): 1-22.
- Malimbwi, R. and Ngaga, Y. (2005). *Payments for Environmental Services as Incentive Opportunities for Catchment Forest Reserves Management in Tanzania*. Paper presented at the Tanzania Association of Foresters Meeting, Dar es Salaam. 19pp.
- Meijer, S.S., Catacutan, D., Ajayi, O.C., Sileshi, G.W. and Nieuwenhuis, M. (2015). The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations among smallholder farmers in sub-Saharan Africa. *International Journal of Agricultural Sustainability* 13(1): 40-54.
- Milder, J.C., Scherr, S.J. and Bracer, C. (2010). Tropics Trends and Future Potential of Payment for Ecosystem Services to Alleviate Rural Poverty in Developing Countries. *Ecology and Society* 15(2): 4-9.
- Mombo, F., Lusambo, L., Speelman, S., Buysse, J., Munishi, P. and G. van Huylenbroeck (2013). Scope for introducing payments for ecosystem services as a strategy to reduce deforestation in the Kilombero wetlands catchment area. *Forest Policy and Economics* 38: 81- 89.
- Nicolaus, K. and Jetzkowitz, J. (2014). How Does Paying for Ecosystem Services Contribute to Sustainable Development? Evidence from Case Study Research in Germany and the UK sustainability ISSN 2071-1050[www. mdpi. com/journal/sustainability] site visited on 10th July 2018.
- Nmadu, J.N., Salawu, H. and Omojoso, B.V. (2015). Socio-economic factors affecting the adoption of innovations by cocoa farmers in Ondo State, Nigeria. *European Journal of Business, Economics and Accounting* 3(2): 58-66.
- Nyanga, P.H. (2012). Factors Influencing Adoption and Area under Conservation Agriculture: A Mixed Methods Approach. *Sustainable Agriculture Research* 1: 27-40.
- Reimer, A.P., Weinkauff, D.K. and Prokopy, L. S. (2012). The influence of perceptions of practice characteristics: An examination of agricultural best management practice adoption in two Indiana watersheds. *Journal of Rural Studies* 28(1): 118-128.
- Ricart, S., Kirk, N. and Ribas, A. (2019). Ecosystem services and multifunctional agriculture: Unravelling informal stakeholders' perceptions and water governance in three European irrigation systems. *Environmental Policy and Governance* 29: 23-34.
- Ro"ling, N.G. and Jiggins, J. (1998). The ecological knowledge system. In: N.G. Ro"ling and M. A. E. Wage makers, eds) *Facilitating sustainable agriculture: participatory learning and adaptive management in times of environmental uncertainty*. Cambridge: Cambridge University Press. pp283-311.
- Rogers, E.M. (1962). Diffusion of Innovation Theory [http://sphweb.bumc. bu.edu/otlt/MPHModules/SB/BehavioralChangeTheories/BehavioralChangeTheories4.html] sited on 25th September 2018.
- Rogers, E.M. (1995). *Diffusion of Innovations* (5th ed.). New York: Free Press. 512pp.
- Rogers, E.M. (2003). *Diffusion of Innovations* (5th ed.). New York: Free Press. 576pp.
- Stein, D. and Valters, C. (2012). Understanding Theory of Change in International Development: International Development Department, LSE, and Houghton Street, London WC2A 2AE. *Justice and Security Research Programme*. 25pp.
- Sterling, S. (2004). *Whole systems thinking as a basis for a paradigm change in education: explorations in the context of sustainability*. Centre for Research in Education and the Environment. 477pp.
- UNICEF (2014). Annual report, Division of Communication 3 United Nations Plaza New York, NY 10017, USA. 64pp.
- Walliman, N. (2006). *Social Research Methods*. Sage Publications, London and Thousand Oaks, New Delhi, India. 224pp.
- Winship, C. and Mare, R. (1984). Regression models with ordinal variables. *American Sociological Review* 49: 512-525.