The Uluguru Payment for Ecosystem Services (PES) Programme in Tanzania: Can Livelihoods Benefits between PES Participants and Non-participants Go Beyond Implementation?

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Abstract
Payments for Ecosystem Services (PES) is a market-based mechanism with potential incentives for managing natural resources while addressing livelihood issues. It operates both directly, through cash payments and indirectly, through adopted Sustainable Land Management practices. However, there is scanty information on sustainability of these benefits. This paper, therefore, informs the extent to which PES benefits can be achieved beyond operationalization of the programme in Uluguru Mountains. The concurrent embedded design was adopted to collect and analyse quantitative as well as qualitative data from 335 households (both PES participants and non-participants). The PES non-participants were involved because they adopted SLM practices even though the programme was not implemented in their villages. Also, focus group discussions, in-depth interviews and observations were employed to collect information for the study. Five livelihood assets, namely, human, social, physical, natural, and financial proposed by Sustainable Livelihood Framework (the DFID 1999 framework) were used as indicators to assess the livelihood benefits. Findings revealed few livelihood benefits, namely, strengthening social networks, access to better shelter as well as housing, increased farm productivity and financial savings. Therefore, local cultural aspects are recommended to sustain benefits of PES beyond the program duration.

Key words: *Livelihood, Ecosystem Services, Sustaining Benefits*

Introduction

Payments for Ecosystem Services (PES) refers to agreements between providers and users of Environmental Services (ES) in which users are beneficiaries of ES who compensate ES providers. In the agreement, ES providers ought to maintain and improve ES provision or reverse their degradation to achieve conservation goals (Wunder, 2015). Over the last two decades, PES has gained prominence as an effective strategy to protect ecosystem services while benefiting landholders through financial transfers conditional to adoption of land use practices (Arriagada *et al.,* 2015). In many cases, PES programmes aim to tackle social and environmental goals, such as the improvement of farmers' livelihoods while encouraging more sustainable land-use practices (Bremer *et al.,* 2014). Theoretically, PES proponents assume that success in internalizing externalities could steer global markets towards development and environmental sustainability. However, there is still controversy about the ability of PES to sustain benefits beyond implementation. One outright debate is associated with ability to achieve dual objectives of conservation and development in theory as well as

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practice (Blundo-Canto *et al.,* 2018; Muradian *et al.,* 2013; Wunder, 2013). In practice, governments from many countries (e.g.,
Brazil, China, Costa Rica, Malawi, and Mexico) implemented large PES programmes to reduce both forest degradation and poverty (Ren *et al.,* 2018). Another rejection towards sustainability is associated with commodification of nature and concern about any market-based rationale to protect ecosystems when the same market-based motivations fuel environmental degradation (Chan *et al.*, 2017; Kosoy & Corbera, 2010; McAfee & Shapiro, 2010).

Many empirical studies show that PES programmes helped in poverty alleviation measures and improved the well-being of participants in various ways (Ren *et al.,* 2018). For example, PES programmes addressed food security and income increase through in-kind (e.g., grain or seedlings) and cash compensation (Duan and Wen, 2015). Moreover, PES programmes facilitated sustainable livelihoods through labour reallocation and training courses (Li *et al.,* 2015). Bennett's (2008) study on "Effects of China's Sloping Land Conversion PES Programme on agricultural households" found out that through increased income programme, China managed to reduce poverty in the Yellow River basin.

Despite benefits that people may receive from PES programme, PES presents a set of issues and challenges to achieve long-term benefits beyond programme duration (Berttram, 2011). In Africa, for example, most PES programmes depend on government or donor funding. This is partly because Africa is characterized by poor communities, which lack the start-up capital necessary to launch projects that are credible enough to attract non-government buyers (IFAD, 2010). Other challenges include lack of self-sustaining financial as well as technical information and inadequate monitoring mechanisms to ensure compliance, inadequate skills, knowledge, resources, and lack of tenure rights to enter into PES agreements (Milder *et al.,* 2010; Wunder, 2007).

In 2006, the PES programme was established in Uluguru Mountains by CARE International and World-Wide Fund for nature (WWF) in collaboration with the local government. It was initiated as a response to decrease in water quality and quantity that resulted from unsustainable land use, which increased sedimentation in Wami-Ruvu Basin (Lopa and Mwanyoka, 2010). Four villages at the catchment upstream water users (providers of ES) were involved as sellers of ES, while Dar es Salaam Water and Sewerage Corporation (DAWASCO) and Coca Cola Kwanza Limited (CCKL) were downstream water users (buyers of ES).

Sustainable land-use practices (henceforth SLM) were introduced to farmers, such as agroforestry and use of benchmark as well as terracing to reduce runoff including erosion. So far, about 134 farmers received payments from DAWASCO (total of US$ 5,060). The payments were made in consideration to land size and technology adopted. The PES programme in Uluguru has been a success story for watershed management in improving people's livelihoods. Studies such as those by Kwayu and

colleagues (2017); Mndeme (2016); Musa and Mwakaje (2013); and John (2012) found out that the PES programme in Uluguru has an impact on participating farmers. For instance, agronomic practices improved crop production, increased food security, and contributed to a cumulative cash income of about 14,700 United States of America dollars (US$) from crop marketing and payment for environmental services (Branca *et al.,* 2011; Lopa and Mwanyoka, 2010).

Despite the mentioned livelihood benefits from PES in Uluguru, the programme failed to ensure consistent payments to farmers as agreed through the signed memorandum of understanding (MoU). Besides, more than half of the participants did not receive anything since programme inception, while those who received had cash payments far below the average household monthly income and below the forgone activities. Such challenges may affect sustainability of PES benefits beyond the programme duration. Therefore, this paper presents and discusses findings from assessment of sustainability of PES benefits on farmers' livelihoods beyond programme implementation.

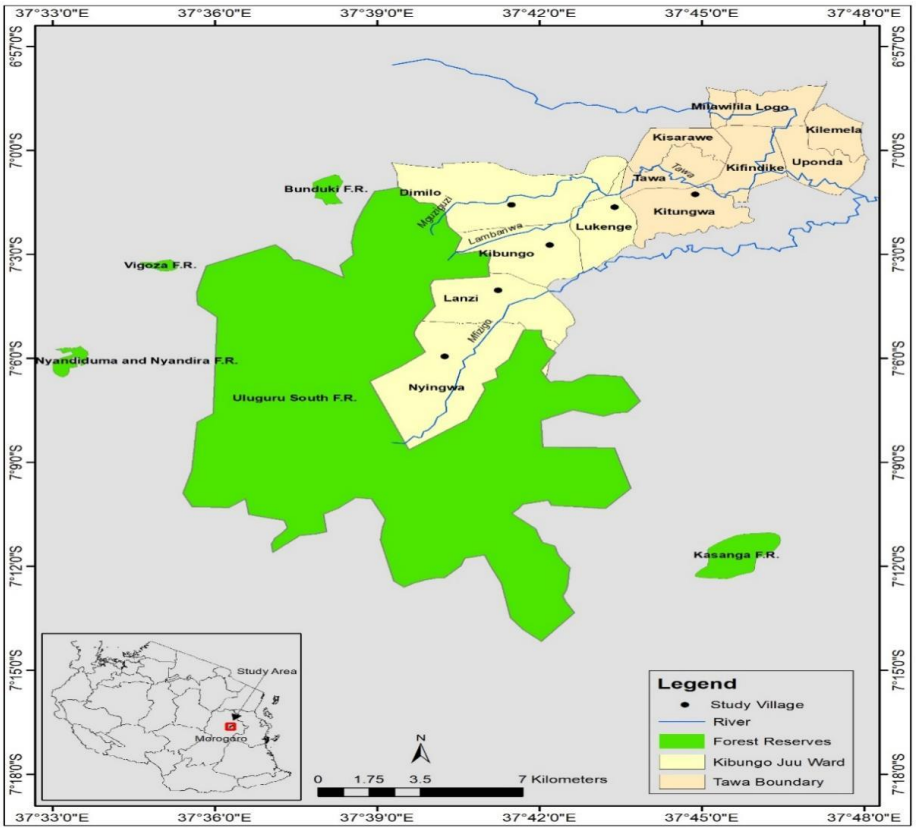
Materials and Methods

Description of the Study Area

The study was conducted in Uluguru South Forest Reserve (FR), which implements the Equitable Payments for Watershed Services (EPWS). This is a PES programme, whose impact is on improved livelihoods of the households (Kwayu, 2016; Mdeme, 2016; Mussa and Mwakaje, 2013; John, 2012). Six villages adjacent to Uluguru South FR were involved in the study. The villages included Nyingwa, Kibungo, Lanzi, Dimilo (with programme) as well as Lukenge and Kitungwa (without PES programme). Uluguru South FR is located at latitude 7° 01' – 7° 12'S and longitude 37° 36' – 37° 45'E (Figure 1). It covers the southern half of the Uluguru Mountains from about 1200 metres above sea level (masl) upwards on the East and from 1800 masl on the western slopes to the summits of Makumbaku (2420 masl), Kimhandu (2634 masl), and Lukwangule Peak (2638 masl). It consists of a wide range of acidic lithosols and ferralitic red as well as yellow and brown latosols developed on Precambrian granulite, gneiss, and migmatite rocks.

A large area of Lukwangule Plateau is covered by peat deposits. Also, the area is characterized by oceanic rainfall and temperature. The area received rainfall ranging between 2500 and 4000 millimetres per year (mm/year) on the eastern slopes and about 2000 mm/year on the western slopes. There is no marked dry season on the eastern slopes, while on the western slopes, there is a dry season from June to October (URT, 2016). The area is characterised by endemic species of restricted distribution and its catchment value is extremely high feeding Ruvu River, which supplies water to millions of people. It includes 60 percent of the Tanzania's electricity generation and drinking water for at least 20 percent of the human population in Tanzanian, 80 percent of industries in Tanzania, and much of irrigated agriculture (Burgess *et al.,* 2002).

Figure 1: Location of the study villages in Morogoro rural district, Tanzania



Source: Cartographic Unit, University of Dar es Salaam (2017).

The Study Design and Data Collection

This study employed concurrent embedded design to allow use of both qualitative and quantitative methods in data collection and analysis. The method is crucial to the study because neither qualitative nor quantitative methods are sufficient to strengthen reliability of data and validity of findings (Terrell, 2012). Four villages, namely, Lanzi, Nyingwa, Dimilo, and Kibungo in Kibungo Juu ward were purposively selected, while Kitungwa and Lukenge villages were randomly selected.

Systematic random sampling was used to select 335 respondents, both PES participants and PES non-participants. It was important to involve PES non-participating farmers because they had adopted SLM even though the programme was not implemented in their villages. Thus, assessment of sustainability of benefits between the two groups is not only essential but imperative.

Purposively, 19 key informants were selected, while stratified sampling procedure was employed to select respondents for focus group discussions. Groups were classified

based on participation but respondents' socio-economic characteristics were not the basis for stratification. Ignoring socio-economic characteristics in sample selection did not affect the sample of the study because stratification criteria greatly vary, depending on the need for investigation (Alvi, 2016). Data collection methods included in-depth interviews, focus group discussions (FGD), and direct observations. Ten FGDs were conducted, two from each treatment village (Lanzi, Kibungo, Nyingwa and Dimilo) and one from each control village (Lukenge and Kitungwa).

Data Processing and Data Analysis

The sustainable livelihood framework (SLF) as suggested by the Department for International Development (DfID) was used to analyse socio-economic impacts of PES on the villages. The framework builds on the belief that people need assets to achieve a positive livelihood outcome. The framework was useful in this study because five capitals, namely, natural, physical, financial, human, and social were used as indicators to assess the livelihood impacts of PES after phase out of the programme. An independent t-test was employed to compare PES participants and non-participants. The independent sample t-test was used to assess if the observed mean difference in livelihood has an impact on both participants and non-participants. Use of independent sample t-test was appropriate because the scale of measurements was ordinal data. Also, p-value was used to explain the likelihood of results if they occurred by change.

Then 15 statements were used to measure social, financial, human, natural and physical capitals resulting from the PES programme after phase out. Every respondent was asked to rate benefits received from the PES programme to know if they were low (1 score), unchanged (2 scores), moderate (3 scores) and high (4 scores) on each statement. The high score explains the rank of the benefits received. The conventional content analysis method was used to analyse qualitative data. The process began by transcribing the data from interviews, focus group discussions, and observation notes. It was followed by coding and categorization of responses using a variety of clustering and classification themes. Thereafter, concepts were attached to major themes using mental abstraction to link and combine abstract concepts to create a theory.

Findings and Discussions

PES Benefits on Human Capital

In Table 2, there is a significant difference (p=0.000) observed between participants and non-participants in-terms of vocational knowledge and skills. Moreover, findings indicate a high score of 243 in terms of vocational knowledge and skills. This implies that participants have more knowledge and understand farming activities, including use of SLM practices than non-participants. This was attributed to knowledge and awareness created by PES programme.

Table 2: Livelihood benefits from PES on human capital

Human capital	Selected livelihood item	Frequency of response * assigned score								T-test and significance
		Low (1)		Unchanged (2)		Moderate (3)		High (4)		
		PP	NP	PP	NP	PP	NP	PP	NP	
	Vocational knowledge and skills	45	29	4	202	243	54	156	80	4.716 * **
	Food security	6	36	-	108	228	132	340	136	10.22 * **

PP= PES participants, NP = Non-participants and * statistically significant at P<0.05, while ** statistically significant at P<0.01

This indicates that PES participants still benefit from knowledge and awareness created even beyond the programme duration through adopted SLM practices. Additionally, the increase in food production due to adopted SLM activities enabled participants to improve nutrition and food security compared to the non-participants. Knowledge created include knowledge on agronomic activities as well as SLM practices, which were provided through training seminars and practical demonstration. There were established demonstration plots for terrace farming, study tours and peer-to-peer sensitization for awareness creation on environmental matters. Findings indicated a significant difference in health and nutritional improvement between participants and non-participants (Table 2). Nutritional improvement was assessed through food availability, particularly the number of meals afforded by the 335 households per day. Although food availability has been improved, there is no significant difference in capacity to adapt to environmental and economic shocks between participants and non-participants. Miranda and colleagues (2003) found the same in Costa Rica where the main impact on human assets relates to capacity building at different levels. There has been substantial improvement in environmental education and solid waste management, involving schools, parents, and civil society.

PES Benefits on Natural Capital

Moreover, capital benefits from PES were assessed with focus on land productivity. This is because land resource is central to the livelihood of poor communities living in rural areas. As argued by FAO (2016), in developing countries, PES programmes focus on increasing land productivity so that the objective of improving the lives of rural communities who are ES providers along with restoring the ecosystem services will be met. Findings indicated that there is no significant difference (p=0.825) between participants and non-participants on land productivity (Table 3). This implies that the observed difference in production between participants and non-participant is not a result of PES programme alone. Other factors that may attribute to this similarity in land productivity between the two groups could be general economic development and improvement of the agriculture sector in the country. The improvement is seen in use of improved seeds and expansion of extension services. Regardless of the other factors

mentioned before in this paper, the fact that non-participating farmers also adopted the SLM practices properly explains the observed similarities.

Table 3: Livelihood benefits from PES on natural capital

Natural capital	Selected livelihood item	Frequency of response * assigned score								T-test and significance
		Low (1)		Unchanged (2)		Moderate (3)		High (4)		
		PP	NP	PP	NP	PP	NP	PP	NP	
	Land productivity	32	107	72	10	177	153	168	20	8.256

PP= PES participants, NP = Non-participants and * statistically significant at P<0.05, while ** statistically significant at P<0.01

PES Benefits on Financial Capital

In the financial capital category four, livelihood items including savings, access to market, access to credit and wages as well as employment were used to evaluate contribution of PES on farmers' livelihoods in the study villages. Findings indicated significant difference in savings between participants and non-participants, while there was no a significant difference observed between the two groups in terms of access to credit and market as well as on wages together with employment (Table 4).

Table 4: Benefits from PES on financial capital

Financial capital	Selected livelihood item	Frequency of response * assigned score								T-test and significance
		Low (1)		Unchanged (2)		Moderate (3)		High (4)		
		PP	NP	PP	NP	PP	NP	PP	NP	
	Savings	89	50	152	222	6	21	-	-	-4.622* **
	Access to credit	58	67	216	202	-	-	-	-	0.858
	Wages and employment	75	71	184	194	-	-	-	-	-0.487
	Access to market	109	102	116	132	-	-	-	-	-16.95

PP= PES participants, and NP = Non-participants and * statistically significant at P<0.05, while ** statistically significant at P<0.01

This indicates that the PES programme enhances the saving ability of participants compared to non-participants. Increased productivity has a direct positive effect on their disposable incomes. During focus group discussion with participants in Lanzi village, one male participant demonstrated that increased production enabled them to make more savings through social groups. The group initiated a savings mechanism where each member was obliged to contribute Tanzanian shillings (Tzs) 2000/= for every Saturday to cater for unforeseen events to its members. This kind of insurance is locally known as "UPATU." Participants appreciated formation of the informal fund, "UPATU," since one would be compensated Tzs 20,000/= when she/he encountered a family problem. So, the PES was appreciated in the area.

With regard to access to market, credit, wages, and employment, there was no significant difference observed between participants and non-participants. The programme created few jobs during its operation. For instance, one male participant was employed as a water gauge reader at Lanzi Village. However, the employment ended after phasing out of the programme. Currently, no one is responsible for reading units of water consumption and the quantity of water flow at the station. This implies that wages and employment magnitude were little as far as PES programme was concerned. The findings further showed no significant (P>0.05) difference in financial gain between participants and non-participants beyond the programme duration.

This indicated that there are other variables responsible for in-income growth, such as general economic development and remittance. Financial capital was limited, except for savings that PES participants had more ability to save than non-participants. Similarly, Clement and Milner-Gulland (2014) found out that the overall impact of PES on a household's welfare was quite limited. This suggests that the rate of change was mainly due to large economic factors, such as Cambodia's rate of economic growth during the study period.

PES Benefits on Physical Capital

Physical capital comprises the basic infrastructure and producer of goods needed to support livelihoods (UNDP, 2017). It focuses on contribution of PES programme towards improvement of access to road, water, sanitation, and clean as well as affordable energy.

Table 5: Livelihood benefits from PES on physical capital

Physical capital	Selected livelihood item	Frequency of response * assigned score								T-test and significance
		Low (1)		Unchanged (2)		Moderate (3)		High (4)		
		PP	NP	PP	NP	PP	NP	PP	NP	
	Shelter and housing	29	14	102	180	126	99	240	64	-1.266***
	Access to information (communication)	53	98	180	140	72	-	-	-	2.651
	Access to road/transport system	68	49	118	200	120	57	-	-	5.872
	Energy resources	116	78	86	172	24	12	-	-	-0.931
	Water supply system	127	105	50	96	45	45	-	-	-2.071

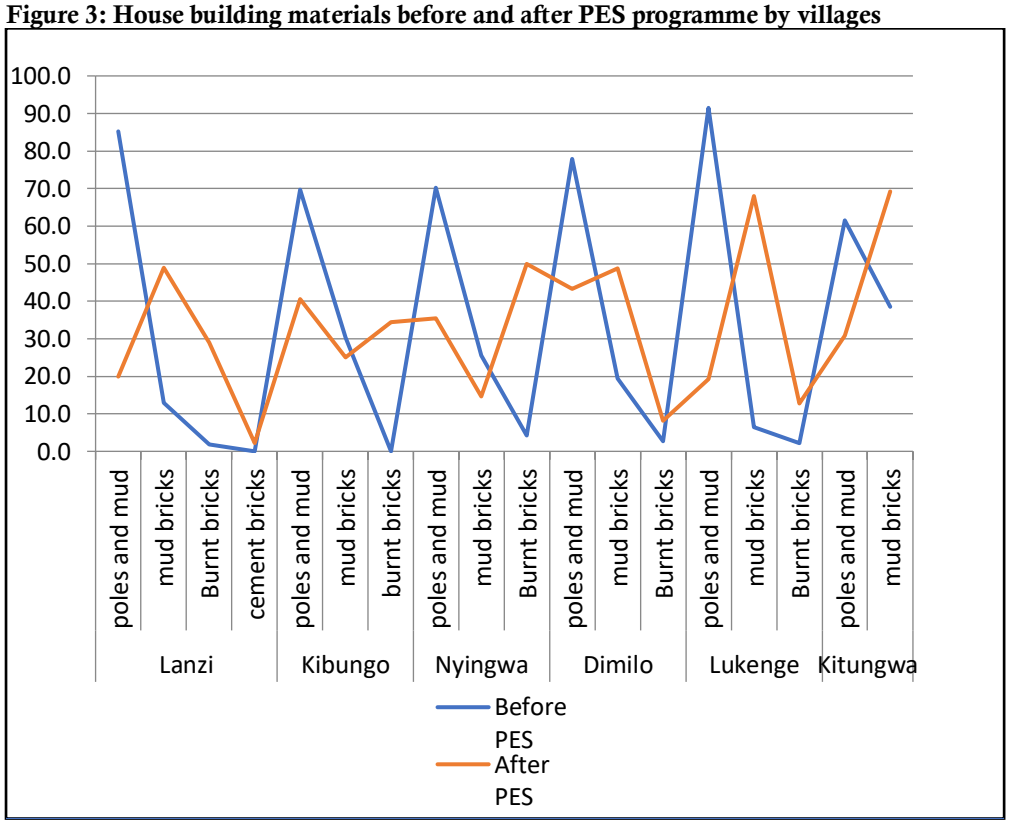
PP= PES participants, NP = Non-participants and * statistically significant at P<0.05, while ** statistically significant at P<0.01

The findings indicated a significant difference between participants and non-participants in in terms of shelter, especially in housing. Apparently, the observed difference in housing between participants and non-participants is a result of farmers' enrolment in PES programme. Moreover, there is a statistically significant difference

between participants and non-participants on access to information/communication, access to road/transport systems, energy resources and water systems (Table 5). Noticeably, there is no major physical infrastructure, such as road or water supply services, which were built as a result of PES programme.

Also, analysis of house buildings and roofing materials between participants and non-participants before as well as after they were enrolled in the PES programme showed a significant difference. Development from mud and poles constructed houses to concrete bricks is observed between both participants and non-participants. Such development followed a similar trend in the control villages where PES programme was not implemented (Figure 3).

Figure 3: House building materials before and after PES programme by villages



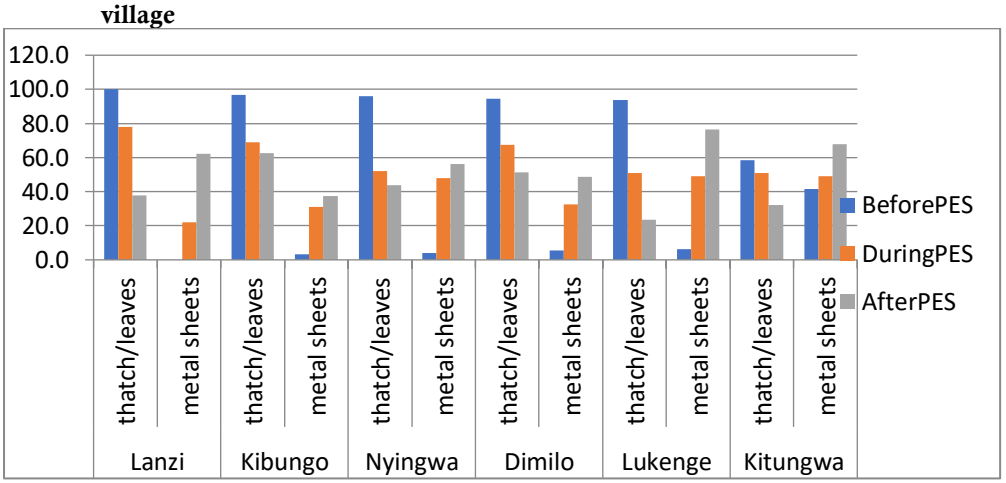
However, PES participants acknowledged the positive impact on their incomes. They argued that the programme helped them to construct modern and durable houses. For instance, during the FGDs with PES participants in Nyingwa Village, one participant said the following, which was supported by the rest of the group discussion members:

> "I really appreciate the impact of the programme on improving our living standards. Currently, I spend my money wisely. I have already demolished the traditional house and constructed a new one with concrete bricks…I am still

> saving money to buy corrugated iron sheets to roof my house. Probably, in the next year, I will be staying in a modern corrugated iron roofed house…Now, I have learnt that it pays to spend money to improve the living standards. We can construct good houses instead of spending the money on none value addition activities, like *kigodoro"* [a Kiswahili traditional dance, commonly practiced in coastal areas of Tanzania].

Figure 3 shows that before the programme, majority of PES participants and non-participants lived in grass thatched houses, but after the programme, a noticeable sharp development to corrugated iron roofing was observed. The shift to metal roofing was also observed in the control villages, Kitungwa and Lukenge. In fact, there were many improved houses in the non-participating villages, like Dimilo and Nyingwa than it was the case in the participating villages. That means the shift in metal roofing is not only caused by an increase in income stemming from the enrolment in the PES programme. There might be other factors to explain such situations. They may include change in attitude among farmers with regards to suitability of improved house programme in the villages. Traditional practices, like witch craft, discouraged the communities from constructing modern houses. Such practices are now ending and most people have now embraced the modern life way, including construction of modern houses.

Figure 4: Change in household roofing materials before, during and after PES program by village



Another reason could be overall awareness and change in life style, which forces people to adopt the metal roofing style. Similarly, during FGD with non-participants in Kitungwa village, one group member said that he changed the traditional roofing materials to corrugated iron sheets because it is the current style of constructing houses, which also reflects that the family is affluent. He further explained that, some years ago, people had money but they feared to use corrugated iron sheets because of beliefs in witchcraft.

PES Benefits on Social Capital

In the SLF context, social capital refers to social resources, which individuals rely on to achieve certain objectives about their livelihoods (Elizondo, 2015). In this study, five selected livelihood items were used to assess benefits from PES programme on social capital. They include networks and communication, leadership skills, trust and mutual support, governance, and participation in events. Findings showed a significant difference between participants and non-participants in networks and communication, trust and mutual support as well as participation in events. Further findings indicated no significant difference observed in terms of governance and leadership skills between participants and non-participants (Table 6).

Table 6: Livelihood benefits from PES on social capital

Social capital	Selected livelihood item	Frequency of response * assigned score								T-test and significance
		Low (1)		Unchanged (2)		Moderate (3)		High (4)		
		PP	NP	PP	NP	PP	NP	PP	NP	
	Networks and communication	90	54	120	210	30	27	32	-	0.627* **
	Leadership skills	37	19	260	298	-	-	-	-	-0.395
	Trust and mutual support	73	35	136	236	48	27	40	24	1.403* **
	Governance	49	42	118	134	126	245	68	36	4.501
	Participation in events	19	25	96	128	237	189	84	64	0.174* **

PP= PES participants, NP = Non-participants and * statistically significant at P<0.05, while ** statistically significant at P<0.01.

The PES programme improved networking among farmers within and outside the villages. This was achieved through a study tour where participants visited several places in Tanzania for learning purposes. Also, during implementation, farmers were supposed to formulate groups of not less than ten people. For example, in Kibungo Village, one farmer was grateful to enrol in PES programme because, even though the programme is for their farmers, it still operated in their village. Through such network, they could help one another not only in farming activities, like excavation of terraces, but also, in other needs like lending money to each other.

Moreover, the network enabled connection with business people in Morogoro town. For instance, the network has enabled PES participants to develop some connections with one owner of the agrochemical shop in Morogoro town. It facilitated procurement of seeds as well as pesticides and could be trusted to purchase some goods from shops on credit. They appreciated a strong network and communication besides trust and mutual support among PES participants. Perrot-Maitre (2006) also noted that introduction of new social and professional networks was important to farmers in Vittle north-eastern France PES scheme. By joining the programme, they provide an intensive agriculture system, which alleviates them from traditional farming networks

and support organisations, farmers' federation. Therefore, the new network provided farmers with technical assistance, such as annual individual farm plans.

Conclusion and Recommendation

Recall, the main objective of this study was to examine sustainability of livelihood benefits to PES participants and non-participants beyond programme implementation in the study area. The findings indicated that some benefits, such as vocational knowledge and skills, land productivity, increased savings, networking, participation in events, trust and mutual support, access to credit and markets can be achieved beyond the programme duration. However, a few benefits can be sustained, such as vocational knowledge, participation in events, trust, mutual support, skills and networking. Others such as employment, access to information, credit and market last when the programme ends. While sustainability of land productivity is largely dependent on continued adopted SLM practices, it was observed that some participants and non-participants dropped the adopted SLM, such as terraces due to lack of manure. This is caused due to the fact that Waluguru people are farmers and not pastoral in nature. Also, the nature of terrain (mountains and hills) is characterised by steep slopes. Therefore, livestock keeping such as cattle is quite difficult. Hence, inadequate supply of manure for farming activities, especially the terrace farming is needed through time in their farming undertakings. Therefore, it is recommended that in order to sustain, PES benefits, it is better to consider culture of the host community during the programme implementation.

References

Alvi, M. (2016). A manual for selecting sampling techniques in research. Online at https://mpra.ub.uni-muenchen.de/70218/ MPRA Paper No. 70218, posted 25th March 2016: 17: 01 UTC.

Arriagada, R. A., Sills, E. O., Ferraro, P. J., & Pattanayak, S. K. (2015). Do payments pay off? Evidence from participation in Costa Rica's PES program. *PloS one*, *10*(7), e0131544.

Branca, G., Lipper, L., Neves, B., Lopa, D., & Mwanyoka, I. (2011). Payments for watershed services supporting sustainable agricultural development in Tanzania. *The Journal of Environment & Development*, *20*(3): 278-302.

Bennett, M. T. (2008). "China's sloping land conversion program: institutional innovation or business as usual?" *Ecological economics*, *65*(4): 699-711.

Berttram, D. V. I. (2011). Payments for Ecosystem Services-A Feasible Mechanisms for Natural Resource Management in East Africa? Master's thesis, Utrecht University, the Netherlands.

Bremer, L. L., Farley, K. A., Lopez-Carr, D., & Romero, J. (2014). Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for 'win–win?' *Ecosystem Services*, *8*: 148-165.

Blundo-Canto, G., Bax, V., Quintero, M., Cruz-Garcia, G. S., Groeneveld, R. A., & Perez-Marulanda, L. (2018). The different dimensions of livelihood impact of Payments for Environmental Services (PES) schemes: A systematic review. *Ecological Economics*, 149: 160-183.

Burgess, N., Doggart, N., & Lovett, J. C. (2002). The Uluguru Mountains of eastern Tanzania: the effect of forest loss on biodiversity. *Oryx*, 36(2): 140-152.

Chan, K. M., Anderson, E., Chapman, M., Jespersen, K., & Olmsted, P. (2017). Payments for ecosystem services: Rife with problems and potential—for transformation towards sustainability. *Ecological Economics*, *140*, 110-122.

Clements, T., & Milner-Gulland, E. J. (2015). Impact of payments for environmental services and protected areas on local livelihoods and forest conservation in northern Cambodia. *Conservation Biology*, 29(1): 78-87.

DfID, U. K. (1999). Sustainable livelihoods guidance sheets. *London: DFID*, *445*.

Duan, W., Lang, Z., & Wen, Y. (2015). The effects of the sloping land conversion program on poverty alleviation in the Wuling mountainous area of China. *Small-scale forestry*, *14*(3): 331-350.

Elizondo, D. (2015). Analysis of the Impact of the UNDP Environmental Project Portfolio from the perspective of Sustainable Livelihoods, *[unpublished paper].*

IFAD (2010). Payments for Watershed Services. International Fund of Agricultural Development

(IDAF), Rome, Italy .Retrieved 31st July 2017, from: http://www.ifad.org/english/water/innowat/topic/payments.htm.

John, I. (2012). *How Successful Has Payment for Environmental Services Improved Welfare*, Dissertation for Award of MA Degree, University of Dar es Salaam, Tanzania.

Kosoy, N. & Corbera, E. (2010). Payments for ecosystem services as commodity fetishism. *Ecological Economics*, 69: 1228-1236. http;//dx.doi.org/10.1016/j.ecolecon.2009.11.002.

Kwayu, E. J. (2016). *The Potential of Agro-Ecosystems Payments for Ecosystem Services to Provide Ecosystem Services and Poverty Reduction in Developing Countries: A Case Study of the EPWS Program in Tanzania*, Doctoral dissertation, University of Leeds.

Kwayu, E. J., Paavola, J., & Sallu, S. M. (2017). The livelihood impacts of the equitable payments for watershed services (EPWS) program in Morogoro, Tanzania. *Environment and Development Economics*, *22*(3), 328-349.

Li, H., Yao, S., Yin, R., & Liu, G. (2015). Assessing the decadal impact of China's sloping land conversion program on household income under enrollment and earning differentiation. *Forest Policy and Economics*, 61: 95-103.

Lopa, D., & Mwanyoka, I. (2010). *Equitable Payments for Watershed Services (EPWS) Programme: A Practical Experience in Delivering Conservation and Poverty Reduction in the Ulugurus. Morogoro, Tanzania*. CARE TZ & WWF Tanzania Programme Office Joint Programme.

McAfee, K. & Shapiro, E. N. (2010). Payments for ecosystem services in Mexico: Nature, neoliberalism, social movements, and the state. Annals of the Association of American Geographers. 100(3): 579-599. http;//dx.doi.org/10.1080/00045601003794833.

Milder, J. C., Scherr, S. J., & Bracer, C. (2010). Trends and future potential of payment for ecosystem services to alleviate rural poverty in developing countries. Ecology and Society, 15(2).

Miranda, M., Porras, I. T., & Moreno, M. L. (2003). *The social impacts of payments for environmental services in Costa Rica: a quantitative field survey and analysis of the Virilla watershed* (No. 1). Iied.

Mndeme, D. R. (2016). *The impacts of payment for environmental services (pes) on communities' livelihoods: the case of Uluguru Mountains, Morogoro region,* Doctoral dissertation, University of Dar es Salaam.

Muradian, R., Arsel, M., Pellegrini, L., Adaman, F., Aguilar, B., Agarwal, B., & Urama, K. (2013). Payments for ecosystem services and the fatal attraction of win-win solutions. *Conservation letters*, *6*(4), 274-279.

Mussa, K. R., & Mwakaje, A. G. (2013). The impact of equitable payment for watershed services scheme on livelihoods in Tanzania: The case of Uluguru Mountains. *International Journal of Development and Sustainability*, *2*(2), 1031-1051.

Perrot-Maître, D. (2006). The Vittel payments for ecosystem services: a 'perfect' PES case. *International Institute for Environment and Development, London: UK*, *24*.

Ren, L., Li, J., Li, C., Li, S., & Daily, G. (2018). "Does Poverty Matter in Payment for Ecosystem Services Program? Participation in the New Stage Sloping Land Conversion Program." *Sustainability,* 10(6): 1888.

Terrell, S. R. (2012). Mixed-methods research methodologies. *The qualitative report*, 17(1), 254-280.

UNDP (United Nations Development Programme) (2017). Application of Sustainable Livelihoods Framework in Development Projects. Guidance Note. United Nations Development Programme Regional Centre for Latin America and the Caribbean Casa de las Naciones Unidas, Ciudad Del Saber, Edificio 128. *Panama City, Panama*.

URT (United Republic of Tanzania). (2016). Uluguru Nature Forest Reserve Management Plan. *National Report*: 123-157.

Wunder, S. (2015). Revisiting the concept of payments for environmental services. *Ecological Economics,* 117: 234-243.

Wunder, S. (2007). The efficiency of payments for environmental services in tropical conservation. *Conservation biology*, 21(1): 48-58.

Wunder, S. (2013). When payments for environmental services will work for conservation. *Conservation Letters,* 6(4): 230-237. http://dx.doi.org.10.1111/conl.12034.