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Article in *International Journal of Scientific & Technology Research* · August 2015

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Assessment of Current State and Impact of REDD+ on Livelihood of Local People in Rungwe District, Tanzania

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Abstract

A climate change mitigation mechanism, Reducing Emission from Deforestation and forest Degradation (REDD+) is anticipated to affect livelihoods of forest dependent communities. This study was conducted to establish this impact on livelihoods of local people in Rungwe District, Tanzania. Data were collected through questionnaires, group discussions, and interviews from three villages: Syukula, Ilolo and Kibisi. Results showed that households annual income and crop production are higher after REDD+ implementation. The older respondents (> 40 years old) considered REDD+ to be important for forest management compared to younger generation (< 40 years old) ($p < 0.05$). Similarly, the older respondents considered wood forest products such as fuelwood, charcoal, timber and poles to be reduced. There was a widespread awareness about REDD+'s objectives among household respondents. Therefore, REDD+ proponents should implement alternative sources of livelihoods to help local people improve their income and reduce dependence on the forest resources and eventually decrease deforestation and forest degradation.

Keywords: Carbon emission; Climate change; Deforestation; Degradation; Livelihoods; REDD+

Introduction

REDD+ is an international mechanism of the United Nations Framework Convention on Climate Change (UNFCCC) which targets to reduce emissions from deforestation and forest degradation (DD), foster rural development and increase climate resilience in developing countries [1,2]. It functions by creating financial incentives to encourage developing countries to reduce carbon emissions by conserving their forests, enhancing carbon stocks and improve livelihoods of local communities [3-5]. It is the world's largest payment for ecosystem service which gives carbon stored in the forest a financial value [4]. Developing countries are continuing with implementation of REDD+ activities since 2008 and those that effectively protect their forests and enhancing carbon stocks receive results-based compensation of carbon payments built on the measurement and reporting of emissions. The measurement of carbon, reporting and verification (MRV) is subjected to domestic and international MRV procedures with respect to guidelines developed under the convention [6-8].

In order REDD+ project to be put in action, during the 15th conference of the parties (COP15), Copenhagen Accord, parties agreed on the need of resources and financial mobilisation from developed countries to support REDD+ initiatives [2-4]. The developing countries in COP17 made voluntary action to prepare and implement National Appropriate Mitigation Actions (NAMA), the policies and actions that developing countries agree to take to reduce their GHG emissions under the Cancun agreements [5]. COPs 16 and 17 encouraged developing countries to stop reduce and reverse forest cover and carbon loss by reducing human pressure on forests by means of addressing the drivers of deforestation and issues related to land tenure, forest governance, gender and equal participation of stakeholders [5-7]

The REDD+ funds come from private, public, bilateral, and multilateral sources including Big International NGOs (BINGOs) [6]. REDD+ payment is either market-based or non-market based [7]. Under the market-based system, a developing country trades its generated carbon credits from REDD+ on the international market,

whereas a non-market based approach involves payments by developed to developing countries under a REDD+ project [7].

Climate change is one of the biggest global challenges to sustainable livelihoods and economic development which is driven by human pressure on natural resources [6,7]. These human-based activities cause DD which, amongst others, lead to high levels of greenhouse gas (GHG) emissions [8-10]. Africa has the highest net loss of forest following South America. Its net loss is about 3.4 million hectares per year [11]. Tanzania's deforestation rate is estimated between 130,000 and 500,000 ha per year [9,11]. This is due to agricultural expansion, livestock grazing, wildfires, over-exploitation and unsustainable utilization of wood resources, mining, and other human activities mostly in the general or common lands [3,12].

Despite the challenges the Tanzania government is facing to conserve and manage its forests, yet is trying to protect its forests by implementing REDD+ policy as a mechanism to stop global climate change [13]. However, it has to guarantee sustainable development of local people whose livelihood depends on forest resources and agricultural practices [14]. This is because the REDD+ mechanism reduces communities' access to forest resources, such as extraction of timber, poles and fuelwood, charcoal production and farming practices, mostly slash and burn agriculture [15]. Though there are funds put in REDD+ projects as incentives to support livelihoods of local people, it is likely that there would be an impact to local communities who perceive the forests to be the sole source of their income and sustainable

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Received August 29, 2015; Accepted September 28, 2015; Published September 30, 2015

Citation: Ojija F (2015) Assessment of Current State and Impact of REDD+ on Livelihood of Local People in Rungwe District, Tanzania. Forest Res 4: 156. doi: [10.4172/2168-9776.1000156](https://doi.org/10.4172/2168-9776.1000156)

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development [8,16].

As Brown [17] points out, the present and future livelihoods of more than 1.6 billion forest- dependent people are potentially at stake under REDD+ if proponents get it wrong. This study was therefore conducted to establish the existing impact of REDD+ projects on livelihood of local people in Rungwe district, Tanzania, by comparing household's income and crops production before and after REDD+ implementation using three study villages: Syukula, Iloilo and Kibisi.

The following were the specific objectives:(i) to assess the impact of REDD+ project on annual income and crop production of households, fuelwood, charcoal, and building materials after REDD+ implementation in the study villages and(ii) to assess household's perception and awareness towards REDD+, and willingness to support REDD+ mechanism in the study villages.

Although the REDD+ mechanism is new and many projects have only been active since a few years, this study can serve as the basis for future research to validate the impact of REDD+ projects on livelihoods of local people. As suggested by Angelsen et al. [8] and Silayo et al. [18] that since REDD+ policy is a continuous process, there is a need to assess the strengths and weaknesses of the global REDD+ mechanism to ensure its sustainability.

Material and Methods

The description of the study area

This study was carried out between July and August 2013 in Rungwe district, Mbeya regional. The area lies between 8°30' and 9°30'S and 33° and 34°E in south-west Tanzania [19]. The district has a total area of 1,231.86 km², and 339,157 people; the climate is tropical with dry and wet seasons with up to 3,000 mm of rainfall a year. The mean annual temperature averages range between 16°C in the highlands and 25°C in the lowland areas [20].

Three study villages: Syukula, Kibisi and Iloilo (Figure 1) were selected based on the following criteria: their vicinity to project area, the Rungwe Forest Nature Reserve (RFNR); their dependency on forest resources and crop cultivation for livelihood is high; and their participation in REDD+ mechanism. REDD+ project activities are implemented by the NGO called Wildlife Conservation Society.

Research methodology

About 10% of the total number of households in each village were surveyed using questionnaires (n=180). The sampling method was adapted from WCS [19] because it was used in similar villages to assess local people's REDD+ readiness. The sampling methods are also comparable to that described in St-Laurent et al. [10], Silayo et al. [18], Majule [20], and Majule and Lema [21]. Three groups one in each village participated in focus group discussion (n = 39). Village leaders

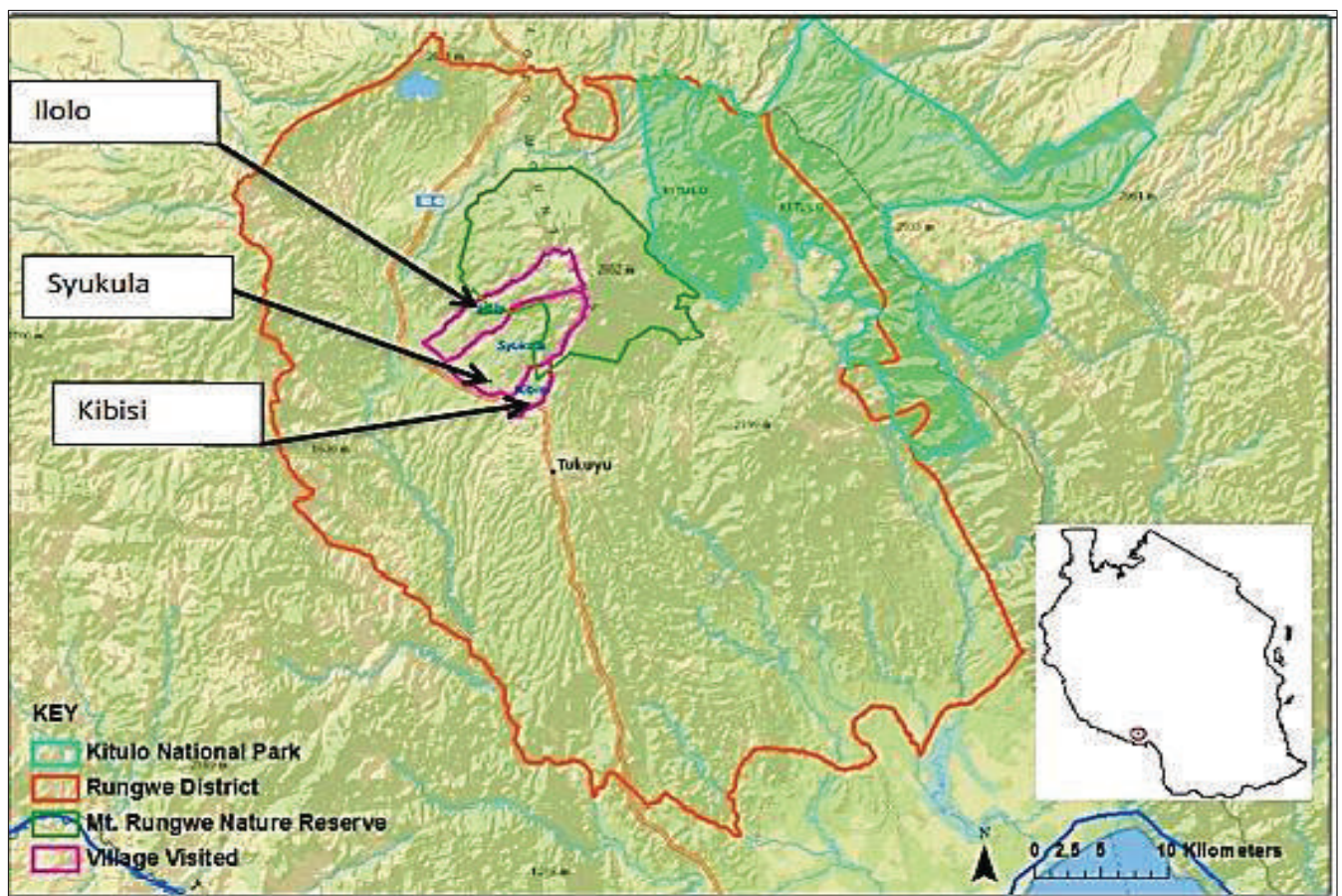


Figure 1: Map showing the location of the study areas and project site.

and staffs from WCS were interviewed. Other facts were collected through literature reviews related to REDD+ mechanism and forests; and field observations.

Data analysis

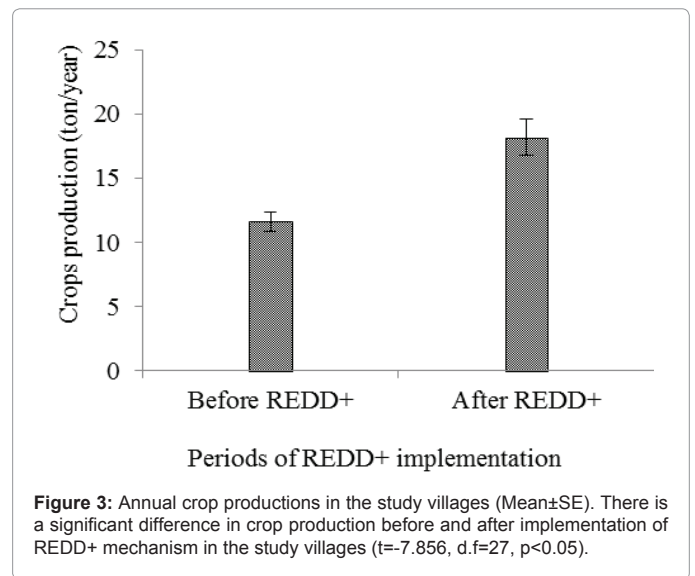
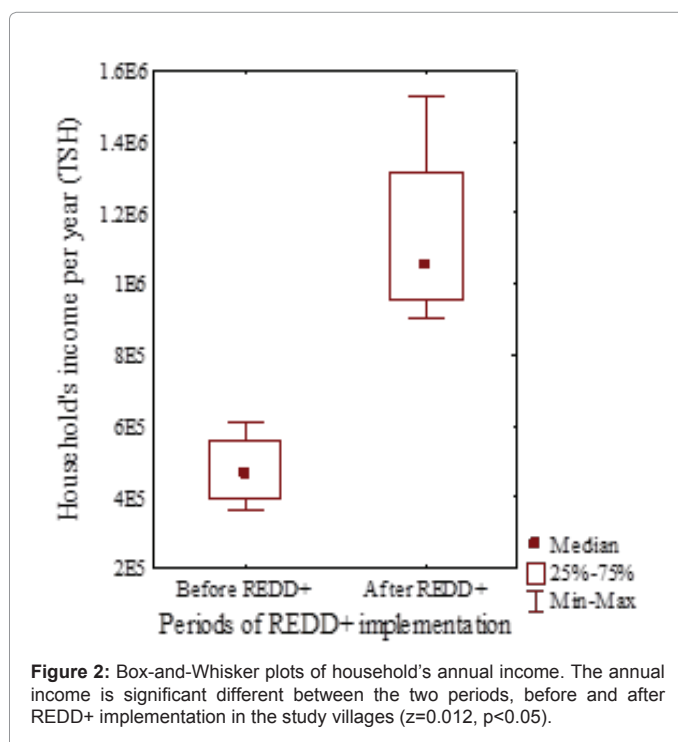
Household's perception about the status of the RFNR, importance of REDD+, and availability of forest wood products, and willingness to support REDD+ activities were analysed using the χ^2 -test. Quantitative data analysis was performed using STATISTICA [22] and were tested for normality using kolmogorov-smirnov.

Data transformations were performed using Box-Cox transformation. Crop production and income data used before REDD+ implementation pertained to the period between 2006 and 2009 while those after REDD+ implementation were between 2010 and 2013. These periods were selected because REDD+ project in the study villages started in 2010 which makes four years period until this study was carried out.

To make unbiased comparison, a period of exactly four years before REDD+ was compared to that after REDD+ implementation. The annual crop production for seven crops (sunflower, cassava, tea, maize, bananas, potatoes, and beans) was compared for the two periods. Crops were selected because they contribute to the household's annual income. Difference in household's income, and crop production per year before and after REDD+ implementation was tested using Wilcoxon Matched Pairs test, and paired two-sample t-test respectively [23]. Both secondary and primary data were used for analysis. Household respondents were grouped into older (>40 years old) and younger (<40 years old) people.

Results

The impact of REDD+ project on household's income and



crop production, fuelwoods, charcoal and building materials

Results showed that household's annual income (Figure 2) and average crop production (Figure 3) are higher after implementation of REDD+ activities. The households (82% in Kibisi, 75% in Iloilo, and 93% in Syukula) rated their access to and use of forest products such as extraction of fuelwood, logging, poles, timber, and charcoal production as much reduced following implementation of REDD+ (Figure 4). The rating differed significantly between older and younger people ($\chi^2=5.227$; $df=1$; $p<0.05$) with a large percentage (59.3%) of older people considering the access and use of forest wood products as much reduced or reduced.

Awareness, perception and willingness or readiness of household respondents for REDD+

Household respondents showed a widespread awareness about the objectives of REDD+ when were questioned about the meaning of REDD+ and its objectives (Figure 5). Many household respondents were willing to support REDD+ activities (Figure 6). The willingness did not differ between older and younger people ($\chi^2=0.290$; $df=1$; $p>0.05$). Figure 7 shows perception of household's respondent on the importance of REDD+ for conservation and management of forest reserve in the study villages. The older respondents considered the REDD+ mechanism to be very important or important for forest conservation compared to younger generation ($\chi^2=5.644$; $df=1$; $p<0.05$).

Discussion

The impact of REDD+ project on household's income, crop production, fuelwood, charcoal and building materials

In most cases REDD+ payments and compensations may not lead to substantial increases in local people's income. Therefore many REDD+ projects have responded by developing programs to create alternative livelihoods and increase incomes through better farming practices, beekeeping, improved stoves, and other income generating activities [24]. In the study villages, the average household's annual income before REDD+ project implementation is lower than after REDD+ implementation (Figure 2). This difference can be contributed to REDD+ incentives such as woodlots, honey bee schemes and use of efficient energy stoves. These incentives might have lessened the

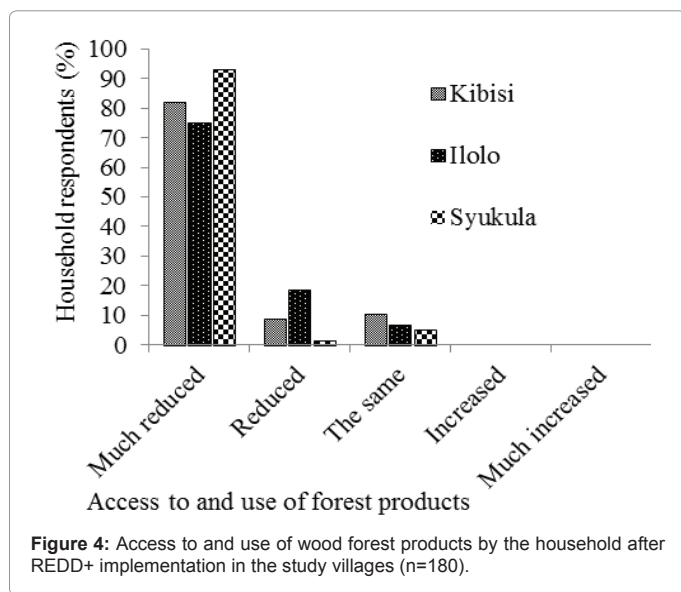


Figure 4: Access to and use of wood forest products by the household after REDD+ implementation in the study villages (n=180).

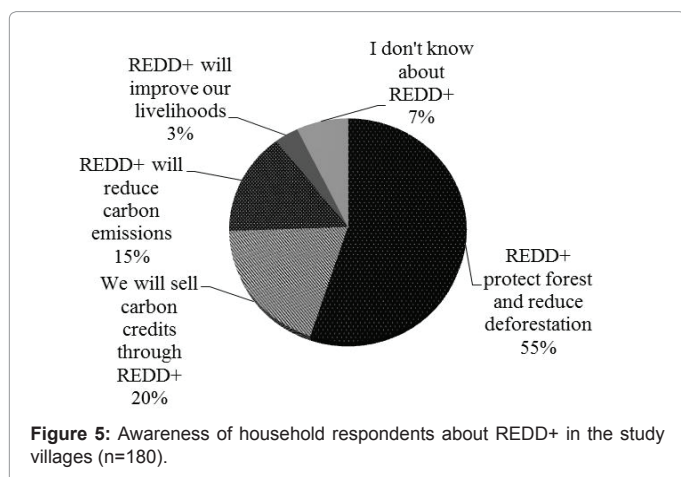


Figure 5: Awareness of household respondents about REDD+ in the study villages (n=180).

consumption of fuelwood and charcoal, and therefore buffering the effect of REDD+ on household's income. The beekeeping programme under the REDD+ project subsidizes the income of households in the study villages. For instance, in 2012 more than 55 L of pure honey were harvested from 120 hives and sold at 7,000 Tsh/litre [19]. This perhaps contributed to household's income. According to interviewed WCS staffs the WCS-REDD+ initiatives did not grab land from local residents to be included in the REDD+ project. Therefore, people kept their land size while increasing crop production with support of fertilizer, improved seeds, pesticides supply, and better agricultural techniques from the WCS and Rungwe district council in the favour of REDD+ projects [19]. Because of the incentives in agricultural sector, mean annual crop production is higher after REDD+ implementation (Figure 3). Therefore, having enough agricultural land and support from WCS possibly improved their crop production and income. Since the household's income depends on crop production, thus, if the REDD+ activities affects the crop production, their income will be affected too.

Therefore, this study shows that currently the REDD+ project in the study villages has little negative effect on the households' income and crop production. However, for the fuelwood, charcoal production, and

building materials such as timber and poles, REDD+ mechanism has decreased their availability (Figure 4). This perception is strong among the older people as compared to the younger ones. This difference in perception is attributed to accumulated knowledge and experience about the RFNR and availability of the wood resources in the past.

Moreover, household's income is independent from REDD+ payment. No household respondent said to have been compensated since the REDD+ project began, despite their participation in REDD+ activities, such as planting trees in the project area. The absence of payment may be due to poor land tenure and management system in three villages which is Joint Forest Management (JFM). Under JFM local communities have no right to compensation [8,25,26]. The carbon payment and compensation in study villages is unclear and people are unaware about the payment. For instance, Silayo et al. [18] claim that the lack of compensation is the focus of the WCS; he also reports that 95% of the respondents had no user rights over the resources in the project area in the Rungwe district. Hence, REDD+ compensation appears to play a relatively weak role to improve local people's income in the study villages.

TFCG [27] the NGO implementing the REDD+ projects in Kilosa and Lindi rural districts in Tanzania, and Brown [17] believe that individual payments are the best choice for REDD+ because the DD is caused by rural community members who clear forests for small scale agriculture, timber, firewood or charcoal. Therefore paying them could make a contribution to reducing deforestation and cash transfers to poorest people in the country [28]. The TFCG paid the participating households, and acknowledged that the payment increased community trust and participation in project activities; it also contributed to improve household's livelihoods, and some started a livestock keeping and small businesses [27].

Also, a study to investigate the system of payment in Brazil, Mexico and Namibia as described in TFCG [28] found that giving little amount of money to rural poor households helped them to start new livelihood, also improved child health and school attendance, eventually reduced illegal exploitation of forest resources. However, in Colombia, for example, the Choco-Darien Conservation Corridor REDD+ project has focused on collective benefits rather than payments to households, and has provided capacity building and new employment opportunities for an Afro-Colombian community [28].

Henceforth, REDD+ payments can be imperative source of funds that some rural members use to improve their farm productivity or allowing others to switch to other economic activities thereby reducing dependence on forest resources [3,17,29,30].

Awareness, perception and willingness or readiness of household respondents for REDD+

The widespread awareness of REDD+ (Figure 5) explains an effort made by WCS in raising REDD+ awareness in the study villages. More than 50% of respondents were supporting REDD+ project because they understood its importance (Figure 6). Understanding the willingness of local people towards REDD+ mechanism is important for REDD+ success [6]. Likewise, understanding the perceptions of stakeholders towards REDD+ is important for successful REDD+ implementation. For instance, St-Laurent et al. [10] state that knowing the perceptions of the civil society and the local people in Panama was vital to learn the possibility of successfully implementing REDD+ mechanism with colonist farmers. In this study, majority of the households (>70%) perceive the REDD+ to be very important for the management of

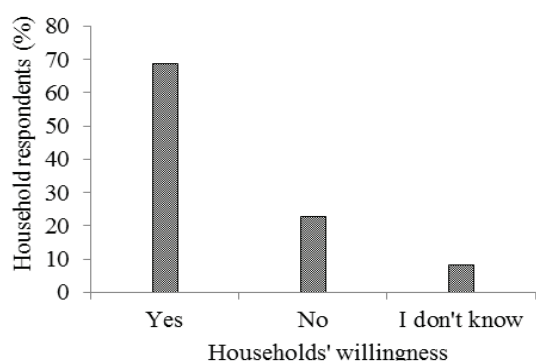


Figure 6: Willingness of household respondents to support REDD+ mechanism (Yes=willing to support; No=unwilling to support; I don't know=undecided yet) (n=180).

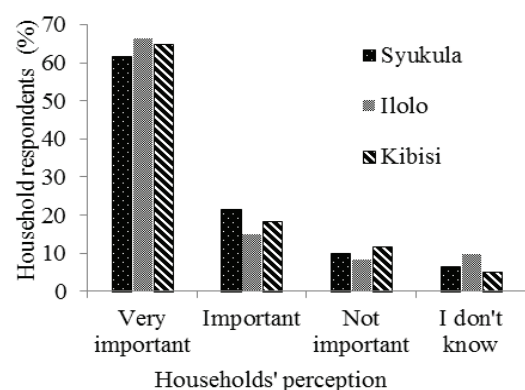


Figure 7: Household's perception on the importance of REDD+ for conservation and management of the forest reserve in the study villages (n=180).

forest and reduction of carbon emissions (Figure 7). This perception differed between younger and older people. A large number of older people (n=89) perceives the REDD+ mechanism to be very important or important for the management of the RFNR. For instance, they stated that illegal harvesting of woods, charcoal production and other causes of DD has declined. They further stated that the RFNR is now in a good condition and less degraded compared to the past years when REDD+ mechanism was not yet on the ground. Additionally, some of the interviewed households see the potential of forests to store carbon as important for their health and livelihoods.

Mayers et al. [31] claim that understanding the local communities' REDD+ willingness is essential for REDD+ sustainability. In this study, the willingness of local people to support REDD+ mechanism and its activities in the study villages was positive and did not differ between younger and older people, and between females and males. This is because the knowledge of the local people about forest loss, climate change and its consequences on the environment and livelihood appears to be good. Therefore, their willingness may enhance the sustainability of REDD+ projects in the study villages. Nevertheless, more work is required to motivate people's willingness to support REDD+ projects including their activities in the study villages.

This study reveals that though local people participate in REDD+ activities, they see little hopes for positive social and economic

benefits from the REDD+ initiatives because there has been neither a payment nor compensations. Despite the scant hope for positive social and economic benefits from the REDD+ initiatives, as experienced by households, they would like to see more effort be put on forest management, ensuring transparency, equal benefit sharing and less corruption.

Conclusions and Recommendations

Forest dependent communities are potentially at stake under REDD+ projects as their livelihoods are threatened with REDD+ mechanism. It is important for REDD+ proponents to identify these problems and implement alternative sources of livelihood and create employment opportunities to help local people improve their income and reduce DD. Besides the potential risks, REDD+ also has the potential to deliver significant social and environmental benefits (such as biodiversity conservation and poverty reduction) in addition to reducing carbon emissions. This study recommends that in order to achieve REDD+ objectives and local development needs, important investments must be made in agriculture sector which is a main source of income for many local people. It further recommends that REDD+ payments to forest dependent communities be established with an equitable level of certainty and transparency so that local communities and indigenous people can participate fully in REDD+ activities.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Acknowledgements

Gratitude is expressed to the Vlaamse Interuniversitaire Raad University Development Cooperation (VLIR-OUS) of Flanders for granting me a scholarship to study in Belgium at Vrije Universiteit Brussel (VUB). Appreciation is also extended to the management of the Mbeya University of Science and Technology, in Tanzania, for granting me a study leave to study in Belgium.

I thank Mr. P.G. Chibwaye (a forest officer) and Mr. Edgar (a natural resources officer, Department of Agriculture and Livestock Development) in the Rungwe district for their sincere support and Mr. H.J. Sauko (WCS staff in the Southerland Highland). I recognize the important help of Mr. W. Matungwa for transport logistics, Mr. M. Baraka and Miss L. Leticia for assisting me during field works. Special thanks go out to the people of Kibisi, Ilolo and Syukula villages for their participation in discussions and interviews; and for sharing with me their knowledge about REDD+ project and the Rungwe forest nature reserve.

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Citation: Ojija F (2015) Assessment of Current State and Impact of REDD+ on Livelihood of Local People in Rungwe District, Tanzania. *Forest Res* 4: 156. doi:[10.4172/2168-9776.1000156](https://doi.org/10.4172/2168-9776.1000156)

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