Original Research Article

Community Poultry Project for conserving the wildlife species in Magombera Forest, Tanzania

ABSTRACT

Aims: Poaching of wildlife is a major challenge in their conservation, including endemic ones like *Procolobus gordonorum*. Local communities in Udzungwa poach for subsistence and small scale commerce. The Community poultry project in Magombera Forest, contributed towards enhancing the conservation of wildlife species through providing community with poultry as an alternative livelihood where meat and income can be generated in legal and convenient methods.

Place and Duration of Study: This study took place in communities surrounding the Magombera Forest in the Morogoro region of Tanzania. The study was conducted from July 2018 to January 2019.

Methodology: Random semi-structured questionnaires with Likert scaling were administered to 119 local communitiy members neighbouring the Magombera Forest. A training workshop in which the participants were trained on veterinary and improved rearing practices in order to address the challenges were administered to 52 participants, followed by pre- and post-training evaluation questions that assessed the challenges and opportunity for poultry keeping.

Results: Sixty one ~~parent~~ percent of respondents reported that they ~~were keeping~~kept chickens before training, after training all showed an inclination to keep chickens for meat and income generation. The respondents reported that challenges for poultry keeping are diseases control, market for products, rearing system and predators and parasites.

Conclusion: Training on poultry production to enhance conservation of biodiversity in Magombera forest is essential. However from this study it is ~~eminent~~ clear that crucial~~,~~ challenges (such as diseases) for successful poultry production, specified by local communities, need ~~is crucial~~ to be dealt with first~~for successful poultry production and conservation of the Magombera forest~~.

Keywords: Poultry, Magombera forest, wildlife Conservation, Tanzania.

1. INTRODUCTION

Biodiversity conservation worldwide has been facing challenges such as overexploitation, pollution, extinction of species and human population increase (Dudgeon et al., 2006). In Tanzania, wildlife poaching for subsistence or commercial reasons, is among of the major causes of resource overexploitation ~~to resource, which can be for subsistence or commercial~~(Carpaneto & Fusari, 2000). Magombera Fforest, the home of endemic species like the Iringa Red Colobus monkey (*Procolobus gordonorum*), has a diversitye of wildlife such as Elephant (*Loxodonta* africana) and Buffalo (*Syncerus caffer*)~~species which are~~being targeted by poachers ~~preference such as Elephant (*Loxodonta* africana) and Buffalo (*Syncerus caffer*),~~ (Mahulu, 2016). Apart from poaching, other threats to wildlife

species in the Magombera forest are anthropogenic factors such as agriculture, hunting, lumbering and un-prescribed fire burning (Mahulu, 2016). Other wildlife species in the Magombera forest includes: Leopard (*Panthera pardus*), hippopotamus (*Hippopotamus amphibius*), together with a diverse number of reptiles and birds. Poaching and lumbering has been observed to increase due to demand of local communities to meet their daily basic needs such as food, and shelter while enhancing their socio economic status (Knapp et al., Peace, & Bechtel, 2017). Other studies such as Mtoka and Ngongolo (2011) have reported that subsistence poaching could be due to protein deficiency in these communities. This suggests that, provision of alternative protein sources and income to local communities neighbouring the protected areas are essential (reference is needed for this last sentence – you cannot make an unsolicited statement!)

Comment [MJ1]: Not part of this study – paoching is specifically identified in the title as the issue under discussion.

Comment [MJ2]: Not part of this study – paoching is specifically identified in the title as the issue under discussion.

There are different alternative sources of protein and income that can be provided to local communities to reduce their dependence on protected areas (Moshi, 2016). These alternative sources include poultry and other livestock production, crop cultivation, beekeeping, and tourism ventures. Kabir *et al.* (2015) showed that poultry production has several advantages over other livestock keeping. Among these benefits are improved livelihood, high growth rate, market availability, adaptation to different climatic conditions, and production of quality protein with less cholesterol than other livestock keeping (Kryger et al., 2010).

Although poultry production can be used as a conservation tool for wildlife species in Magombera forest, there are still some challenges facing it. Studies such as Fèvre *et al*. (2006), Kabir *et al*. (2015) and Miller *et al.* (2017) revealed that the main challenge for poultry production in Tanzania is diseases due to climate, management and environments. Understanding the challenges of poultry production at a local level is essential for proper and strategic introduction of the project as a tool for conservingation of wildlife species.

In communities neighbouring the Magombera Forest little has been done to assess the attitude of local communities on the poultry production and its implication in the conservation of thise Magombera forest. This study thus aimed at elucidating the attitude of local communities on the proposed poultry production, and its implications for the conservation of the Magombera Forest and its biodiversity.

2. MATERIAL AND METHODS

2.1. Study area (why these fonts change from Arial to Times Roman?)

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This study took place in the Katurukila village (-7.894632, 36.946321), Magombera (-7.819661, 36.94661) and Msolwa (-7.794525, 37.037042) villages neighbouring the Magombera Forest (-7.821984, 36.983364) in the Morogoro region of Tanzania. Locals are involved in subsistence agricultural activities such as cultivation of sugarcane, rice, maize, beans, cowpeas and fruits such as mangoes majorly for subsistence, while sugarcane is being for commercially produced. Other activities like poaching, lumbering, honey harvesting from the forest are occasionally reported (Mahulu, 2016).

Comment [MJ3]: If poaching is occassionally reported, why is it then highlighted as a major issues in the title of this paper?

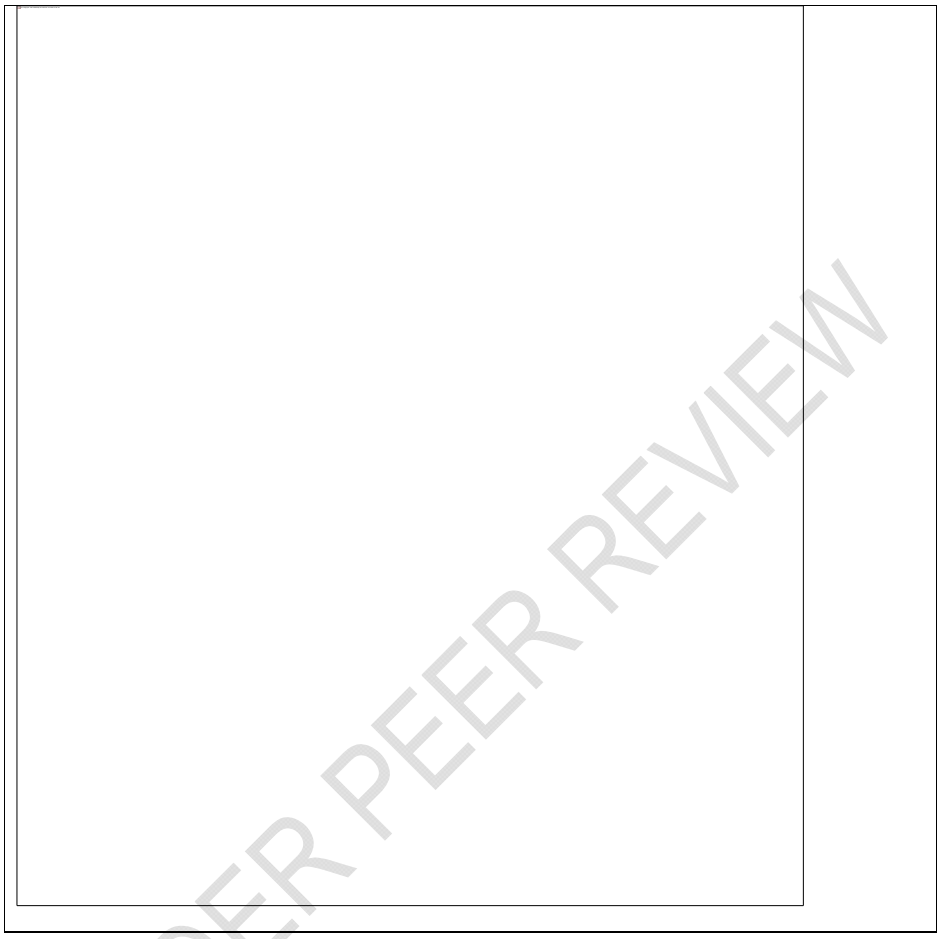

Figure 1. Map showing the Magombera Forest area (was created using QGIS with the help from Google Earth™) Map does not present all required information & arrow wrongly positioned.

~~2.2.~~2.1. Methods (remove numbers of sub-headings)

Data collection involved both open- and closed- -ended questions in ~~the~~ self-administered semi-structured questionnaires and field survey. In addition, participatory training was conducted to the local communities neighbouring the Magombera Forest. Selection of respondents was randomly ~~selected~~ using ~~the computer from the~~a list of villagers provided by ~~the~~ local government leaders. The distribution of the questionnaires to selection the participants were done regardless of the sex, age, occupation ~~and~~ or education levels.

A total of 119 questionnaires were addressed distributed to the selected respondents to enquire on their attitude and opinion of the benefits of the poultry keeping, to the local communities and the conservation of wildlife and other biodiversity in the Magombera Forest. Additional ~~The~~ information enquired in the questionnaire ~~among others~~ included the relationship of poultry keeping and the conservation of biodiversity in the Magombera forest. Consent forms were ~~requested to be fill~~completed by ~~the~~ interviewees who ~~were able and ready for interview~~participated.

~~The questionnaire forms were distributed randomly to the local communities in Katurukila village. The distribution of the questionnaires to the participants was done regardless of the sex, age, occupation and education levels. The information enquired in the questionnaire among others included the relationship of poultry keeping and the conservation of biodiversity in the Magombera forest.~~

Comment [MJ4]: Duplication of paragraph 1 under methods

Data analysis

The Likert scaling was used for measuring different statements in the questions, where ~~by~~ 1-~~s~~Strongly disagrees, 2-disagree, 3-Don't know, 4-agree and 5-strongly agree, as suggested by Kothali, (2007). In addition, the trainees were asked to rank the awareness acquired after training in the following categories: 0-25%, 26-50%, 51-75% and 76-100%.

Raw data were entered into excel ready for analysis. Descriptive statistical was used to summarize the data. The variation in attitude for different response into various measuring statements w~~ere~~as tested using the non~~e~~-parametric statistical Friedman Test (reference needed for Friedman Test Friedman, Milton (1940). A comparison of alternative tests of significance for the problem of m rankings. The Annals of Mathematical Statistics. 11(1): 86–92)~~Statistic~~

3. RESULTS AND DISCUSSION (WHY THESE FONTS CHANGE FROM TIMES NEW ROMAN TO ARIAL?)

Community poultry keeping benefits

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The response from the participants varied on their attitude and opinion on the benefit of poultry keeping. ~~The~~ Results showed that 5.26%, 31.57%, 36.84% and 26.32% of participants in the interviewed strongly disagreed, didn't know, agreed and strongly agreed respectively on the benefit of poultry keeping ~~to~~ by local communities. In terms of benefits to the local communities, ~~t~~The highest scores were observed for employment (3.789±0.249) as well as ~~nd~~ manure for crop growing and support for conservation of forest (3.737±0.252 each) (Table 1). The variation in attitude among local communities on the benefit accrued from poultry production were ~~not~~ statistically insignificant (Q=0.599, P=0.988, df=5).

The biodiversity in the Magombera F~~f~~orest

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In addition, poultry production was observed to have a positive ~~advantage~~ impact on the conservation of biodiversity in the Magombera F~~f~~orest. With availability of poultry production the local communities said that there is no need for poaching, and they were positive in supporting conservation of forest resources (T~~t~~able 1).

Table 1: The average Likert Score for the benefits of poultry keeping to local communities neighbouring Magombera forest and the conserved Biodiversity in the Magombera F~~f~~orest.

C/n	Benefits	Mean±S.E	Max	Range
1	Employment	3.789±0.249	5	4
2	Income	3.632±0.244	5	4
3	Support conservation of Forest	3.737±0.240	5	4
4	Food	3.632±0.232	5	4
5	No need of poaching	3.474±0.309	5	4
6	Manure for crop growing	3.737±0.252	5	4

Employment opportunities, source of income and food were identified by this study to be among the benefits obtained from poultry keeping. Findings from Rufiji district (Tanzania) showed that poultry production increased income of families and provide protein to local communities adjacent to the Selous Game Reserve (Samuel & Ngongolo, 2011). This is in agreement with other studies such as Save the Children (n.d) and Kabir et al. (2015), which showed that, through accessibility of food, employment and income from poultry production, ~~the~~ family livelihood is improved. During our study we one chicken casted Tsh 15000/= (7USD) which implies that, if local communities are supported via chicken~~on the~~ production ~~of chicken~~ in th~~ei~~s~~e~~ villages, they are able to generate~~provide~~ a basic income that caters for ~~need such as~~ school fees for kids, clothing, food, shelter and health care. ~~From this study it was eminent that, poultry production~~This in turn will enhance the conservation of Magombera forest by limiting poaching~~through gaining fromlocal communities support in the conservation. The local communities were observed to be positive in conservation and not involving in poaching because they are getting benefits from poultry production~~.

Comment [PM5]: Bad grammar

Manure for crop production was also pointed by the local communities around the Magombera forest as a benefit that can be accrued from poultry faming. Poultry manure is well known to contain considerable amount of Nitrogen, Phosphorus, Potassium and micronutrients (Steiner *et al*., 2010), which are essential for crop production. (Ahn *et al*. (2010) ~~have~~ also revealed the potential of poultry manure from biogas production. This could be an alternative ~~good~~ source of energy ~~to local communities~~ for cooking and lightening, instead of using fuel ~~fire~~wood obtained from the forest that~~which~~ causes deforestation.

YOU STILL NEED TO DISCUSS RESULTS RELATED TO:

SUPPORT TO CONSERVATION OF THE FOREST (SAME MEAN VALUE AS MANURE!)

ATTITUDE TOWARDS BIODIVERSITY CONSERVATION IN THE MAGOMBERA FOREST

Challenges for Poultry Keeping by the Local communities neighbouring Magombera Forest

Of the 119 responses obtained, s~~About~~ 5.26% didn't know about~~the existing~~ challenges that relate to~~for~~ poultry keeping, 15.79% noted (agreed) that there are ~~agreed that the~~ challenges associated with~~for~~ poultry keeping, ~~are there~~ while 78.95% strongly agreed with the statement that there are existing of challenges related to~~in the~~ poultry keeping by local communities around the Magombera F~~f~~orest. The challenges identified ~~scored~~ by ~~the~~ local

communities were; lack of capital to start poultry production, diseases for poultry, poor availability of veterinary services, and limited market for the poultry products (Table 2). The diseases and parasites pointed by the pastoralists in this study were; Chicken Lice (5%), Newcastle (70%), Fowl typhoid (5%), and Worms (5%). The variation in their attitude and response on the challenges facing poultry production was not statistically significant (Q=1.077, P= 0.783, df=3).

Comment [PM6]: These should add up to 100%, currently it adds up to 85%, 15% missing from calculation

Table 2. The mean score for different challenges mentioned by local communities surrounding the Magombera Fforest

C/n	Challenges	Mean±S.E	Max	Range
1	Capital to start the Business	4.632±0.175	5	3
2	Diseases to Poultry	4.579±0.139	5	2
3	Availability of veterinary services	4.632±0.175	5	3
4	Market for the Poultry Products	4.737±0.129	5	2

Among the major threat of wildlife conservation is poaching (Bennett et al., 2002) apart from habitat destruction (Gill, 2007), climate change, human population and diseases (Daszak *et al*., 2000). Poaching can be for commercial purpose or domestic use (subsistence). Subsistence poaching is acerbated by insufficient of protein sources availability to the communities adjacent to the wildlife conservation areas(Samuel & Ngongolo, 2011). It is believed that, outreach to the local communities surrounding the biodiversity potential is essential to build the trust to these people because they are custodian of the surrounding biodiversity resources (Kahler *et al*., 2013). In this study, the local communities stated that, the poultry production can provide protein to their family thus there is no need to poach. Which suggest that, if they are supported in modern poultry production, there will be easy access of protein source to the household compared to poaching wildlife which require much effort with uncertainties. It was anticipated in this study that, the poultry keeping by the communities neighbouring the Magombera forest will increases the availability of protein and income thus enhancing the conservation of Magombera forest through reduced poaching and tree cutting (habitat destruction). Furthermore, information on the benefit of poultry keeping and challenges facing poultry production in these local communities was enquired. Understanding the challenges will pave the way for proper and sustainable introducing the poultry project to the local communities adjacent the Magombera forest.

Challenges like lack of capital, diseases, insufficient veterinary services and market for poultry production were stated by the local communities to face poultry production. This tallies with other studies which have reported that, diseases, heat stress, lack of capital are among of the challenges in the poultry production (Lara & Rostagno, 2013). Understanding challenges of poultry production is essential for proper control while enhancing production which enables the local to give positive support in the conservation of the Magombera forest and its biodiversity including the Iringa red Colobus monkey

Three issues (results) are presented above

(1) Agreement level to the statement that challenges exist in poultry rearing

(2) Diseases and parasites identified
(3) Variation in attitude and responses on challenges facing poultry production
THESE ISSUES (RESULTS) PRESENTED ABOVE MUST BE DISCUSSED – YOUR DISCUSSION ABOVE DO NOT RELATE TO THESE RESULTS!!!

Impact of training on the poultry production to local communities neighbouring Magombera forest

Fifty twoA total of 52 individuals received training on poultry production and its benefits in the conservation of biodiversity in the Magombera Fforest. A total ofbout 96.15% of respondents showed an interest to start poultry keeping after receiving training. The increase in awareness after training on poultry keeping varied for different reasonsamong variables. These include the awareness on Poultry Keeping System (=74.083±3.58%), Product accrued from Poultry (=61.417±3.582%), Diseases Control strategies (=63.25±5.215%), Market of Poultry product (=76.00±3.616%), as well as Conservation of Magombera Fforest and its benefits (=81.917±3.06%). The increase in awareness after training was statistical significant (Q = 12.083, P=0.034)

From this result it is clear that, before initiating the poultry production in relationship to biodiversity conservation to local communities it is essential to ensure that, thoroughly training is done. Training provides a road map for successful project implementation. Training to local communities equips them to be able and independently involved in poultry production. Also it enables the local communities to properly understating the importancet of forests and be able to provide positive support in conservation efforts.

CONCLUSION

To ensure sustainable and profitable poultry production by the local communities, there is a need to collaborate with multiple livestock production stakeholders particularly the veterinarians and/or livestock field officers for controlling the diseases, also processors and traders who will help the farmers to search for the market. Furthermore training to local communities on the poultry production and how to overcome challenges such as diseases, search market should emphasised. PThe proper poultry production byto local communities will alleviate poaching particularly the subsistence poaching.

Comment [PM7]: ?

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