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The Role of Translocal Practices in a Natural Climate Solution in Ghana

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Abstract: People-centred reforestation is one of the ways to achieve natural climate solutions. Ghana has established a people-centred reforestation programme known as the Modified Taunya System (MTS) where local people are assigned degraded forest reserves to practice agroforestry. Given that the MTS is a people-centred initiative, socioeconomic factors are likely to have impact on the reforestation drive. This study aims to understand the role of translocal practices of remittances and visits by migrants on the MTS. Using multi-sited, sequential explanatory mixed methods and the lens of socioecological systems, the study shows that social capital and socioeconomic obligations of cash remittances from, as well as visits by migrants to their communities of origin play positive roles on reforestation under the MTS. Specifically, translocal households have access to, and use remittances to engage relatively better in the MTS than households that do not receive remittances. This shows that translocal practices can have a positive impact on the environment at the area of origin of migrants where there are people-centred environmental policies in place.

Keywords: agroforestry; multi-sited research; reforestation; remittances; sequential explanatory mixed methods; socioecological systems



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1. Introduction

Natural climate solutions (NCSs) are pathways to sequester greenhouse gases from the atmosphere to prevent climate catastrophe [1,2]. NCSs involve the “conservation, restoration, and improved land management actions that increase carbon storage and/or avoid greenhouse gas emissions across global forests, wetlands, grasslands, and agricultural lands” [2] (p. 11645). Forest-focused NCSs are estimated to have the highest climate mitigation potential followed by agricultural and grassland before wetland management [3]. Forests alone have the capacity to sequester about one-third of the current anthropogenic CO₂ emissions from the atmosphere [2,4,5]. In order of highest climate mitigation potential under forest, reforestation, management of natural forest, avoiding forest conversion, urban reforestation, fire management and improved plantations are the specific forest-focused NCS [3]. Reforestation is one of the mature, cost-effective and quick natural climate solutions not only for carbon dioxide sequestration, but also with other benefits such as water and air purification, improved soil fertility and biodiversity in general [2,3,6]. NCSs largely, and reforestation in particular, reflect two of the overall 17 United Nations Sustainable Development Goals (SDGs), namely, SDG 15, with great potential for achieving SDG 13 [7–9]. SDG 13 aims at addressing climate change and its impacts. SDG 15 aims to “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”. Further, NCS and reforestation reflect goals formulated in the United Nations Framework Convention on Climate Change (UNFCCC) that was agreed on during the 21st Conference of the Parties (COP 21) in 2015 to reduce and sequester greenhouse gasses [10].

To achieve successful NCSs through afforestation, people-centred reforestation is necessary as it makes relevant indigenous knowledge acquired through adaptive learning, norms and values available in management practices to suit local social, ecological and political contexts [11–13] and encourages distribution of power [14,15]. An example of people-centred reforestation and management programme is the Modified Taungya System (MTS) in Ghana. The MTS is an agroforestry scheme initiated by the Forest Commission (FC) of Ghana in 2002 in collaboration with farmers to address deforestation in the country [16,17]. The FC demarcates degraded forest reserve and provides tree saplings to farmers to engage in agroforestry. Farmers cultivate crops to keep and plant the trees, 40% of which they are entitled to when their plantations are thinned (while the central government equally takes 40%, 15% goes to the traditional authority of the area, and 5% goes to the community) [16,18,19].

This people-centred reforestation is underpinned by socioecological systems thinking that forest and society are intrinsically linked. The MTS as a socioecological system initiative can be affected by many socioeconomic factors including migration and flow of remittances. Migration is a livelihood strategy in Ghana and rural–urban migration is prevalent in many forest-adjacent communities where the MTS is being implemented. Translocal practices can have impact on the environment at the areas of origin of migrants [20–22]. It is therefore important to examine the effect visits and remittances (which are essential parts of translocal practices) to migrants' areas of origin have on reforestation under the MTS.

We initiate a discourse on the intersections of translocal practices and natural climate solutions using the MTS in Ghana as a case study. The article shows that translocal practices are encouraging NCSs through reforestation under the MTS in Ghana. Specifically, with a people-centred reforestation policy in place, local farmers have leveraged on the flow of remittances to engage meaningfully in the MTS. People-centred reforestation policy has encouraged even migrants to engage in the MTS at their place of origin. Our analysis stresses that people-centred reforestation is crucial to achieving natural climate solutions and that translocal practices should be considered in future forest policies in Ghana.

2. Socioecological Systems

We draw insight from Ostrom's (2009) general framework for analysing Socio-Ecological Systems (SESs). SESs are complex interactions between humans (social) and the biophysical environment or the biosphere (ecological) [23,24]. The social system is the interactions and interdependencies of human beings, which are often sanctioned or guided by rules, norms, social relations and economic considerations. The ecological system is the interdependencies among the components of the biophysical environment that ensure ecological balance. SES thinking is that the biophysical environment provides human beings with resources and in extracting those resources, human beings shape the biophysical environment [15,24]. The coupling relationship between society and the biophysical environment means that the functioning of the ecological system and ethical stewardship are fundamental to our existence [15]. In short, socioecological systems define life on earth.

Ostrom [24] posits that within the SESs, there are subsystems such as resource system, resource unit, governance system and users interacting to produce outcomes, which in turn affect the subsystems. The resource system and resource unit are the ecological components while the governance system and resource users are the social components of the SESs. Land use and its cover change, which are often driven by socioeconomic, technological and political factors, are primary sources of social influence on the ecological system. For instance, the economic needs of the people (resources users) and the existing resource extraction policies or rules, norms and cultural beliefs (governance system) determine how ecological resources are extracted and managed. Thus, the governance system and the resource users' ability for self-organisation determine the sustainability of resource extraction and the resilience of the ecological system [24].

Despite the usefulness of the SESs in understanding the human-ecological interactions, it possesses a weakness. There is a simplified notion that the interaction among the subsystems occur within a place independent of other places. However, the complex

interaction between human beings and their biophysical environment is not encapsulated within a closed system limited to a place. People in faraway places are increasingly consuming ecosystem resource that are extracted or produced locally and their activities have implications for the ecology of the producing area [15]. Therefore, we adopt and modify Ostrom's (2009) general framework of SESs with insights from the translocal socioecological systems approach put forward by Greiner et al. [25,26].

In Figure 1, we conceptualised that the resource system (forest biome) and resource units (trees, non-tree forest products (NTFP), micro-organisms, soil) and the governance system (rules of the MTS, norms and social relations) and actors (resource users participating farmers, FC and community) can be impacted by translocal practices of visits and remittances by migrants across the translocal social field [21,25]. The entry point of translocal practices in the SESs is often through, but not limited to, local actors, mainly farmers. This is because "migrant remittance are a key rural–urban [connection] that fundamentally reshapes social-ecological dynamics" [20] (p. 7).

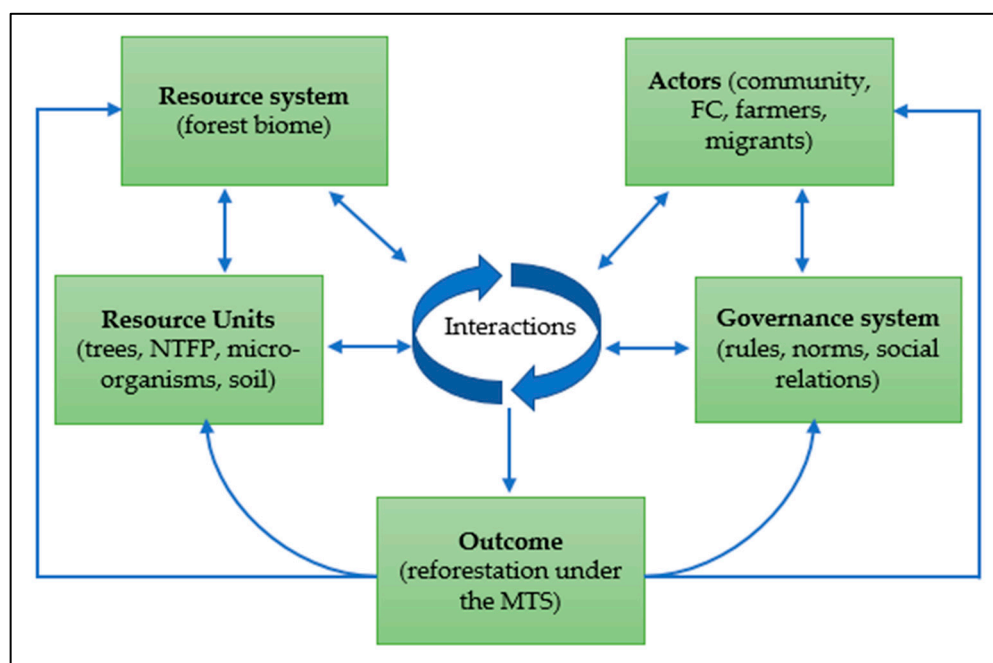


Figure 1. Conceptual Framework based on Ostrom (2009) and Greiner et al. (2014) [25,26].

3. Materials and Methods

3.1. Study Area

The study was conducted in Fanteakwa South, Fanteakwa North and Atiwa East districts in the Eastern Region of Ghana involving five communities (Figure 2) as the origin of migrants. These communities (Dadetsunya, Besebuom, Feyiase, Frimponso and Olantan also known as Owurantan) were purposively selected for two reasons. First, they are farming communities engaging in the MTS and benefiting directly from the forest. Second, there is a prevalence of out-migration from the communities. Although these are independent political administrative districts, the Begoro District Forest Commission is responsible for managing the forest resources in all the three districts.

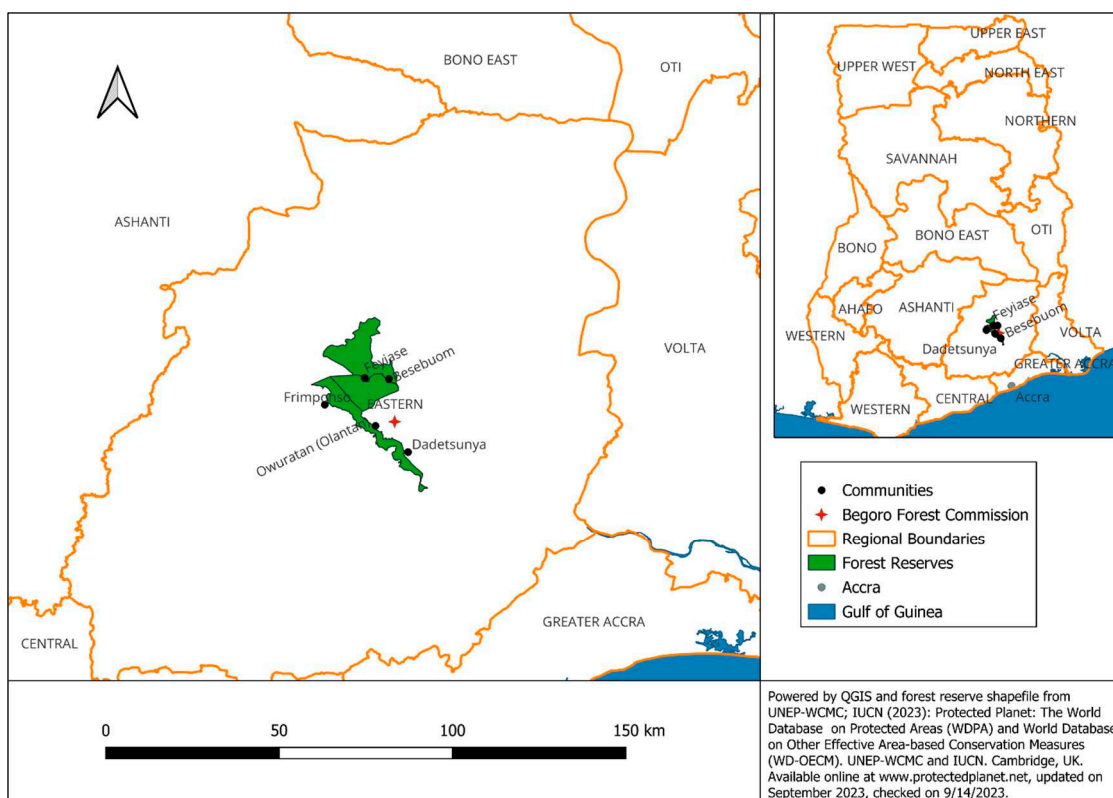


Figure 2. Map of the study communities and the forest reserves.

The districts are generally rural, as almost 60% of the population live in remote areas [27]. The Eastern Region in general has recorded a -4.7% rural population growth over the past decade. The decrease in rural population is even higher (more than -5%) in our study districts [27]. Prior to the data collected, we visited several communities that are engaged in the MTS and through informal conversations with opinion leaders, confirmed the prevalence of out-migration from the communities.

The communities are located in the forest zones in the Eastern Region. With the exception of a small semisavannah vegetation towards the Volta River in the north-east, about 80% of the vegetation is tropical, wet semideciduous forest [28]. Two of the forest reserves along which our study communities are located and being used for the MTS are Worobong South (109.35 km^2) and Southern Scarp (155 km^2) [28]. Illegal logging and encroachment on the reserves have accelerated deforestation in the area. Deforestation, however, is not peculiar to our study area. It is a general challenge in Ghana as 2% of the forest cover, equivalent to 1350 km^2 is degraded annually through unsustainable timber extraction, agriculture and illegal mining [29]. It is against this background that the MTS is being used to restore the reserves.

The communities are characterised by double maxima rainfall with a short-lived dry season between November and February. Since 1980, the highest rainfall in the area was 3204.80 mm, recorded in 1986. The mean rainfall was 1644.39 mm with a standard deviation of 748.54 mm, indicating high rainfall variability [30]. Rainfall has reduced consistently over the years [31]. In normal years, the heaviest rainfall is recorded in the month of June but the pattern in the area has deviated from the norm with increasing unpredictability. Temperature in the area has also increased by $1 \text{ }^\circ\text{C}$ since 1980 [30]. Thus, the area is experiencing a change in climate, which is affecting farming activities [31].

3.2. Data

We adopted sequential explanatory mixed methods (SEMM), in which quantitative methods precede qualitative methods but the results are integrated in a single study [32–34].

We employed SEMM because we use a deductive approach to research and it also enabled us to identify other suitable research participants and the destination of migrants for the study [35]. In this section, we present the sampling techniques, data collection and analysis of the multi-sited SEMM research we conducted.

With no current data on the demographics of the study communities, we conducted a listing exercise with maps based on enumeration areas—the smallest area that the Ghana Statistical Service demarcates and uses for population and housing censuses—to know the total number of households (our unit of analysis) and population as well as migrant and non-migrant households. We decided to sample at least fifty households from each community of origin and at least 75% migrant households in the overall sampled households. We therefore employed stratified simple random sampling technique to select 286 households from the five communities. Stratified sampling is often employed to ensure that each stratum (in this case, migrant and non-migrant households) is adequately represented in the sampled population to enhance the quality of the data [36]. Given that our aim is to understand the role of translocal practices in the MTS, we need more migrant households, hence, the use of stratified sampling. Table 1 shows the sampling frame and the sampled households from each community.

Table 1. Sample frame.

Community	Number of Households		Selected Households	
	Migrant	Non-Migrant	Migrant	Non-Migrant
Dadetsunya	102	48	36	17
Besebuom	124	35	45	10
Feyiase	129	31	41	12
Frimponso	71	41	40	18
Olantan	79	18	55	12
Total	505	173	217	69

The first stage of data collection was a quantitative baseline survey in the five communities. The survey was conducted in August 2022 with 5 field assistants using a Computer Assisted Personal Interviewing (CAPI) programmed with the Census and Survey Processing System (CSPPro) 7.7.1 software, and supervised by the lead author. The questions were programmed in the CSPPro application and put on tablets for the listing and the survey. So, the quantitative data collection was conducted digitally with the tablets. The use of CAPI served considerations of saving time and financial means and enhanced the quality of the data. Paper questionnaires would have required additional means for data entry, which could even introduce errors. The CAPI data were uploaded to a server every day and where there are inconsistencies or errors, the data manager informed the responsible research assistant to revisit the particular household for correction or clarification before s/he continues with the survey.

In each selected household, the questionnaire was administered to any available and capable adult member. Where there were two or more qualified respondents available, we encouraged them to collaborate to answer the survey to enhance the quality of the data. The survey was used to collect data on the socioeconomic and migration history of each household member above 10 years, destination of migrants, translocal practices of resource exchange and use of remittance, use of forest resources and the involvement of the household in the MTS. The second phase was qualitative data collection, which took place from January to March 2023 with semistructured interviews, focus group discussions and observation in the five communities. The lead author conducted 30 interviews with participating (25) and nonparticipating (5) farmers of the MTS. He also conducted 5 focus group discussions comprising between 10 and 13 participants in the communities. Expert interviews were also conducted with three forest guards and one forest official from the Begoro Forest Service Division who are responsible for managing the forest in the study area.

In the third phase of data collection, we followed and administered a questionnaire to 50 migrants in the Greater Accra Region, the most popular destination outside the region of origin (Eastern) as revealed by the baseline survey. During the baseline survey, we took data on the socioeconomic characteristics, contact details and destination of migrants. It was these migrants that we traced to their destination to engage them on their translocal processes and practices. In the last phase of data collection, biographic interviews were conducted with 5 migrants in Accra. The biographic interview method was suitable to map the migration trajectories of migrants in the course of their lives.

We used the Statistical Package for the Social Sciences (SPSS) 29.0 for descriptive and bivariate analyses of the quantitative data. Contingency tables and diagrammes were generated from the survey data. The qualitative interviews were transcribed and subjected to content analysis. The textual data were coded thematically and similar contents were merged to understand patterns. The quantitative and the qualitative results are integrated to enhance the understanding of the study. Where necessary, we provide quotations to bring readers closer to the research participants.

4. Results

We found that local people depend directly on the forest for many resources and they are engaged in the Modified Taungya System (MTS) to enrich the forest. Also, social relations play critical roles in forming farmer groups to access degraded forestland to engage in the MTS. Furthermore, translocal practices, such as remittances and visits by migrants, have enabled many translocal (migrant) households to engage effectively in the MTS at the place of origin. Thus, the results show that remittances impact socioecological systems of the MTS. The findings are presented in details below.

4.1. Human–Forest Relationship

Research participants mentioned several resources that they take from the forest. When asked to rank the top five most important resources that they directly take from the forest (Table 2), firewood emerged as the highest, followed by protein sources such as mushrooms, bushmeat or snails. In fact, out of the 286 households, 259 (90.5%) ranked firewood as an important resource that they extract from the forest. Table 2 also shows that only one household does not take any resources directly from the forest.

Table 2. Ranked top 5 main resources extracted from the forest.

Resources	1st Rank	2nd Rank	3rd Rank	4th Rank	5th Rank	Total
Timber	3	6	2	0	1	12
Firewood	221	34	3	1	0	259
Mushroom/bushmeat/snails	52	120	41	26	0	239
Herbs	6	48	108	29	0	191
Fruits	3	59	56	28	1	147
Total	285	267	210	84	2	848

The in-depth interviews revealed that some people hunt at night or set traps in the forest to catch wild animals, such as grasscutters, antelopes and rats, for sale or to supplement their own source of protein. Others also collect snails and wild mushrooms from the forest during the raining season. Some also indicated the cultural value of the forest as well as its role in mitigating climate change. Additionally, degraded forest reserve is a valuable resource for agroforestry, providing a source of livelihood to many households as they consume and sell the crops they produce under the MTS.

When asked about their contributions to sustaining the forest, many respondents indicated that they sometimes try to create fire belts around their farms, which in turn protect the forest against wildfires. The main contribution of local people to sustaining the forest is their engagement in reforestation under the MTS. As presented in Figure 3, most of the households are engaged in the MTS.

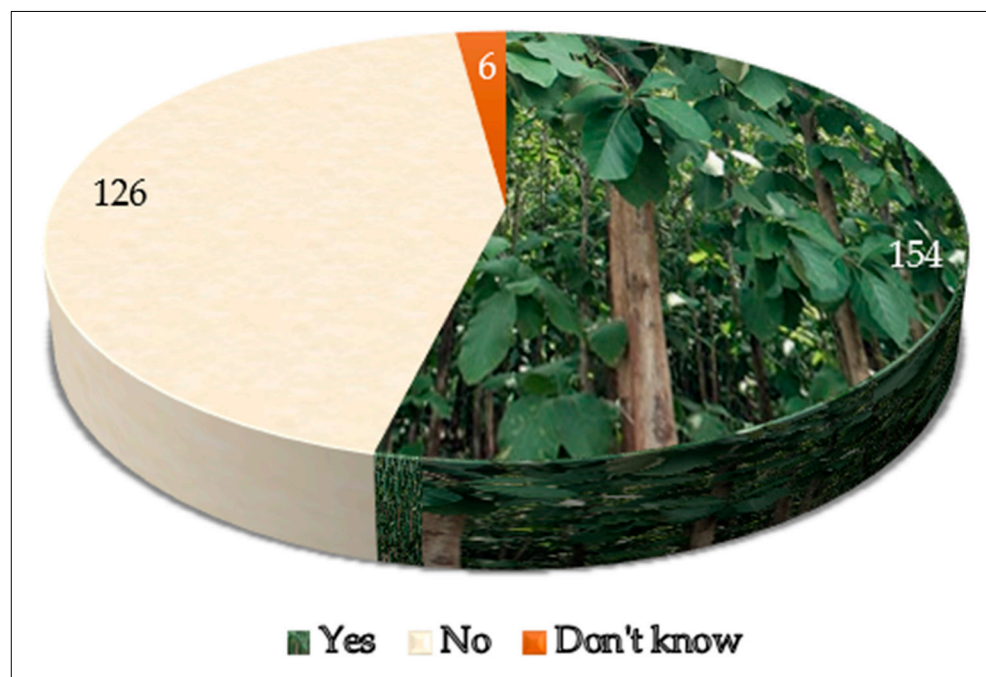


Figure 3. Engagement in the MTS.

We ran a Chi-Square analysis on the quantitative data to check if migrant households have a higher chance of having access to forest reserves or otherwise but the result does not indicate any significant difference in the migration status of households and involvement in the MTS. In other words, being a migrant or non-migrant household has no influence on engagement in the MTS. Typically, the Forest Commission (FC), through their Forest Protection Guards (FPG), encourages communities near degraded forest reserves to tender their application or the farmers on their own volition form groups and express their interest in the MTS through writing to the FC. According to a research participant, they

make the application in the name of the community but you can also send an individual application or form a group of 10 or 20 people and apply. When we apply in the name of the community or in a group and we are allocated an area, we then share it according to our number and cultivate our crops and plant the trees. [Research participant, Dadetsunya, 2023]

Whereas people can apply individually if they have a good track record for engaging in the MTS, the FC prefers group to individual application because each member is liable and responsible for the collective effectiveness of tree planting on the lands that would be demarcated to them. Farmers revealed that they include only hardworking farmers in the group because they do not want a “lazy” farmer who would derail the group’s effort of planting the trees to the satisfaction of the FC. According to the research participants, if a farmer in a group does not plant the trees as required, the entire group is held responsible and will either be forced to plant trees on the defaulter’s farm, the land will be reassigned to a different group member to plant the tree or every member risk being blacklisted by the FC for the MTS.

Regarding their motivation for engaging in the MTS, farmers indicated that deforestation is contributing less rainfall in their communities, and they want to contribute to the restoration of the forest. Also, where participating farmers are informed about their benefits aside from the crops they produce on the MTS plots, they indicated that their share in the trees they plant is also a source of motivation for engaging in the agroforestry initiative. Yet, many of them do not bother to make agreement with the FC or are even unaware of their 40% in the trees they plant. The most important reason for engaging in the MTS is access to degraded forestland to cultivate food crops. Most of the households owned between

one and four hectares of farmland. Only two households have more than ten hectares of farmland. Intra- and intergenerational sharing of family land is a major cause for shrinking farmland owned by households, rendering it inadequate to sustain their agricultural-based livelihood. According to a research participant,

My grandfather bought about 20 acres of land and when he died, it was shared evenly between his two sons, my father and my uncle. My father was not able to buy additional land and after he died, what he inherited was divided equally among me and my three brothers. How many acres of land do you think each of us has received? I hope you can imagine the size of land each of my two sons will inherit when I die. So, our lands have become smaller. [Research participant, Besebuom, 2023]

This means that for most of the research participants, land is owned through a patrilineal system of inheritance. The lands are rectangular and, in most cases, the longer sides (length) face east and west. The land is often divided at the shorter sides so the breadth of the land for individuals becomes very short (narrow) while the length remains the same over generations and time. So, where people allow their lands to fallow, siblings need to plan and clear at the same place to farm. Otherwise, if one clears part of his land but those s/he shares boundaries with at both sides (east and west) do not clear theirs, the bush will cast a shadow over the crops before and after noon, depriving them of adequate sunlight, increasing pests and diseases and contributing to poor yields. So, there are cases where people have land to farm but the ecological conditions discourage them from cultivating it.

Further, some farmers, especially in Olantan, do not own land in the community so they are engaged purely in sharecropping. An opinion leader who is also engaged in the MTS has this to say:

We are engaged in sharecropping here and the land is taken over by the cocoa. You see, we started with plantain cultivation and we interplanted cocoa. So, over time, the cocoa grew to overshadow the plantain. So, we are now mainly involved in cocoa farming. With the forestland, the arrangement is not sharecropping, whatever farm produce we get, we do not share with anyone so we earn more income from taungya. [the MTS] [Research participant, Olantan, 2023]

In this community, the land is owned by absentee landlords (people who are not farmers and do not stay in the village) but they want their land cultivated to produce cash crop that would earn them higher returns for a longer period of time. They engage farmers to cultivate their land for cash crops like cocoa and oil palm on a sharecropping agreement. The scarcity of land was confirmed during a focus group discussion in the community as follows:

We have seen that there are portions of the forest that were degraded and as farmland is also becoming scarce for us, we applied to the forest commission and the forest guards came and demarcated the land to us. We need the land to farm crops and that is the main reason why we applied to be considered for the MTS. [Focus group discussion, Olantan, 2023]

Furthermore, obtaining land to rent is becoming hard and many are not prepared to engage in sharecropping. There are stool lands, which is land that the traditional authority, mostly the chief, holds in trust on behalf of his people, in communities like Feyiase that farmers can rent; however, in the rest of the communities, landowners prefer sharecropping because they earn more in that arrangement. Some farmers, on the other hand do not want to engage in sharecropping because they earn less than if they rent the land. In a usual sharecropping arrangement, the landowner provides only the land and the farmer has to provide capital and inputs to cultivate it and the proceeds are shared equally or into three (farmer takes two-thirds) depending on the crop involved and the agreement or norm in place. Farmers indicated that with the increasing cost of inputs like weedicides, fertilizers and labour, and low prices for food crops, engaging in sharecropping benefits the landowners more than them.

Additionally, the ecology of degraded forestland is a motivation for some farmers to engage in the MTS. When asked if she would still engage in the MTS if she had her own land, a female participant indicated that she would engage in the MTS because the forest land is more fertile. This means that it is not only the shrinking or lack of individual farmland that causes people to engage in the MTS but also, the soil quality of forest reserve. Most farmers have subjected their land to continuous cultivation with reduced fallow periods, rendering it less fertile as compared to the degraded forest reserve. Thus, the forestland can be cultivated without application of chemical fertilizers, which helps in reducing the cost of production.

There are several reasons why 44% of the selected households are not involved in the MTS. Some of the people could not find any farmer group yet to accept them and enhance their chances of having access to degraded forestland to do the MTS. Others also have land or are too old and that is the reason why they are not interested in the MTS. The qualitative interviews reveal that there are strict regulations for engaging in the MTS. Farmers indicated that they are prohibited from engaging in burning the cleared bush. Slash but not burn requires brute force or adequate financial means to engage farm labourers. Farmers are also not allowed to apply weedicides after they plant the tree saplings. Meanwhile, controlling weed with weicide is faster and cheaper than the traditional method of using the cutlass.

It is evident that the forest is a source of many resources to the communities. With this, farmers are engaging in the MTS to restore the forest while, at the same time, cultivating crops to obtain even more from the forest. However, the cost of maintaining a farm under the MTS is relative higher. We now turn to the translocal practices of migrants and their households in the community of origin and their role in the MTS.

4.2. The Role of Translocal Practices of Visits and Remittances on the MTS

The quantitative data revealed that 217 (76%) and 69 (24%) of the selected households are migrant and non-migrant households, respectively. There were 488 migrants excluding students, indicating that on average, each translocal household has two of its members staying outside the communities of origin. Although there are several translocal practices, we focus on remittances and visits that have direct implications for the MTS.

One of the translocal practices is migrants paying visits to their communities of origin and specifically to their households. The modal frequency (17%) at which migrants visit their communities of origin is more than once every quarter (every three months). In a multiple-choice response, some of the migrants indicated that they visit to be with the family and tend to family matters (52%), attend community, religious or family festivities (47%) or work on the family farm (33%). Other minor reasons why migrants visit their communities of origin were to conduct other business, for medical purposes or to share resources (give or receive mostly money and food). The qualitative interviews also revealed that most migrants visit their communities when they feel homesick for their family members or when someone dies to sympathise with the bereaved family and give funeral donations and, most importantly, during Christmas to celebrate with their families and meet other migrants who would also visit.

Of the 50 migrants that we followed, 12 still engage in farming activities. They visit their communities of origin usually at the beginning of the farming season to help clear the land and plant food crops as their contributing to securing food for the household. Some of them said that they do so because if there is food in the village for their aging parents, it lessens the burden of having to send money for subsistence frequently. Through their visits, they assist on the family farms, including agroforestry under the MTS. This is important given that engagement in the MTS is labour intensive.

Another translocal practice of translocal households is the sharing of resources, mainly money. The modal frequency (21%) that migrants send money to their household in the communities is quarterly (every three months). Others send money as and when necessary or when they have saved enough (16%) or on monthly basis (14%). As presented in Table 3, many translocal households at the origin receive between 250 and 500 Ghana Cedis in cash

remittances in the past twelve months preceding data collection (1 Euro was 12 Ghana Cedis at the time of data collection).

Table 3. Remittances (in Ghana Cedis) received 12 months preceding the baseline survey.

Amount	Frequency	Percent
<100	10	2.0
101–250	21	4.3
251–500	66	13.5
501–1000	36	7.4
1001–2500	25	5.1
2501–5000	14	2.9
>5000	8	1.6
Refused	5	1.0
Do not know	78	16.0
Total	263	53.9
Missing System	225	46.1
Total	488	100.0

Some respondents do not know the amount of money sent by some of the migrants (16%) to their household members. This indicates that remittances sent to individual household members are sometimes not disclosed to other members in the household.

Remittances play a crucial role in farming activities at the area of origin. Table 4 represents the intended purposes for which migrants sent remittances or what they believed recipients would use it for.

Table 4. Ranked intended use of remittances sent by migrants.

Use of Remittances	1st Rank	2nd Rank	3rd Rank	Total
Basic food	24	5	1	30
Education	6	6	1	13
Health Care	11	13	3	27
Marriage/Funeral	4	7	5	16
Energy/petrol/gas/fire wood/char coal	0	2	0	2
Agricultural investment	2	7	8	17
Hiring Labour	2	0	4	6
Total	49	40	22	111

Table 4 indicates that only one migrant has not sent cash remittances during the twelve months preceding the survey. Also, besides food and health care, remittances are intended for agricultural purpose. Table 5 presents the 5 most important uses of remittances sent by migrants.

Table 5. Ranked uses of remittances received by household at the origin.

Uses of Remittances	Ranks					Total
	1st Rank	2nd Rank	3rd Rank	4th Rank	5th Rank	
Basic food	156	45	24	2	2	229
Education	14	42	20	9	0	85
Health Care	29	56	42	20	4	151
Agricultural investment	28	29	13	8	3	81
Hiring Labour	32	17	20	15	7	91

Table 5 shows that after basic food, agriculture is an important sector where cash remittances are spent. The combined frequency of the use remittances for agricultural investment and hiring of labour for farm work is higher than for health care. This has tremendous implications for farmers who are engaged in the MTS as continuous engagement of farmers in the MTS by the FC depends on their past record of effective tree-planting

services. For instance, in the latest MTS rolled out in Dadetsunya in 2021, degraded forest reserve was demarcated to the community as a group and was shared with every person who was interested. Farmers received about $1\frac{1}{4}$ acre each. Despite the relatively small size of the assigned land, some could not plant trees to the satisfaction of the FC. So, the FC reassigned the land to a few farmers who performed relatively better in 2021. In the 2022 major farming season, those farmers had about 4 acres of land each to cultivate and plant trees. This is what the Forest Protection Guard (FPG) responsible for the community said:

Last two years [2021], we released land to 72 people in Dadetsunya community who applied to do the MTS. We realized that some were lazy and could not plant enough trees and weed their farms. So, I suggested to my madam [his superior technical officer] that we engage only a few people for the MTS in the next batch. She agreed so, last year, we released land to only 22 people who were able to plant and protect the trees as required. [FPG, Begoro, 2023]

This finding is contrary to what has been reported by Ros-Tonen et al. [17] that “once [degraded forestland is] allocated, farmers have secure access to land to plant trees and grow food crops until canopy closure”. In our study area, the security of assigned degraded forestland is not guaranteed. Rather, it depends on the tree-planting performance of the farmer. Additionally, while the Forest Protection Guard classified some of the farmers as “lazy”, the experience of farmers shows otherwise as the FC also has its challenges. Some farmers revealed that although they applied to the FC to engage in the MTS much earlier, the approval delayed and the land was demarcated to them after they had already cleared their private, rented or sharecropping lands for cultivation for that farming season. However, given that the degraded forest reserve is more fertile, they went ahead to clear it. Consequently, many farmers found themselves having bigger farms to work on and those that do not have adequate financial means were overwhelmed by the demand of the farming activities. The FC also failed to provide adequate sapling to farmers on time. Realising that the FC was delaying, proactive farmers took the initiative to search for saplings under mature trees in the forest to plant on their farms. Many of the farmers strived to work hard to plant trees on their farms but they lack enough money to engage the services of farm labourers. Here is a conversation with a farmer, which indicates the critical role of cash remittances for effective engagement in the MTS.

Interviewer: Do you use the money your children send to you to do the MTS?

Research participant, Feyiase (RPF): Yes, but if what they send is not enough for my farming activities, I have to add up. We use the remittance for other things as well not only for farming.

Interviewer: if they were not able to send you any money, what would have happened to your farming activities?

RPF: I wouldn't have been able to cultivate 4 acres of farm under [the MTS].

Interviewer: Why?

RPF: Farm inputs and labour are expensive. So, before I got involved [in the MTS], I called and asked them if they would be able to send me more money when the farming season starts. They assured me they would help and they have kept their promise. You see, unlike our own lands where we can use weedicides whenever we like, the forest officials do not permit us to use weedicides after we have planted the saplings. We have to weed the farm often either by ourselves or hire farm labourers and that is why it is expensive to do taungya [the MTS].

Interviewer: If you did not receive cash remittances from your children, how many acres do you think you would have been able to do with your own strength?

RPF: I would have managed 2 acres of farm under [the MTS]. That is, an acre each year since this current batch of [the MTS] started [Research participant, Feyiase, 2023].

We have employed counterfactual to see if farmers would still have been able to engage effectively in the MTS if they did not receive cash remittances or if they would have performed better if they have received more money. A farmer who is currently cultivating 4 acres said “I could have cultivated 8 acres and plant the tree if I get financial support from someone” [Research participant, Frimponso, 2023]. This farmer has no migrant in his household. She is even supporting her children in school at the moment. Most of the farmers who do not receive remittances believed that they would have been able to cultivate more acres of land and to plant more trees if they have financial support from the government. Many cash remittance-receiving farmers mince no words by saying, just like RPF above, that they would not have been able to cultivate the number of acres they are currently managing under the MTS if they have not received financial support from migrants.

It is important to note that some non-migrant households have managed to plant trees and weed their farms to the satisfaction of the FC because they have the manpower for farm work. When asked if a lack of money is the cause of nonperformance of some farmers engaging in the MTS, a farmer of a non-migrant household said:

Yes, money definitely plays a role in farming but the lack of it is not the only reason why some people could not maintain their farms. For instance, I didn't hire labourers to work on my farm. I use my own strength. So, I think it also depends on strength and determination. [Research participant, Dadetsunya, 2023]

That notwithstanding, cash remittance received by the left behind are impacting positively on to reforestation under the MTS.

5. Discussion

The result shows that there is active and direct interaction between study communities (social systems) and the forests (an ecological systems). In situ social relations play a role in the formation of farmers groups for enhancing their chances of being assigned degraded forest reserve to engage in the Modified Taungya System (MTS) as has also been reported by Ros-Tonen et al. [37]. This local social relation, as observed by Steinbrink and Niedenföhr [21], is developed through daily interaction of the people. Through these interactions, local people familiarize themselves with the farming skills and capacity of one another, which inform their decision on who is, or not included when they form farmer groups to apply for degraded forestland to engage in the MTS. Social relations are sometimes weaponised to exclude potential farmers from engaging in the MTS by branding them as indolent. This has also been found by Adjei et al. [18], where farmers applied to engaged in the MTS but local group leaders did not assign them any land because the applicants are seen as “lazy”. Additionally, customs and tradition of sharing land among sons leading to shrinking of per capita land holdings of households has implication on the forest. This sociocultural practice activates socioeconomic needs for the use of degraded forestland to cultivate crops and plant trees. As found in the Juaboso district by Wiersma [38], overconcentration on cocoa production has been another cause of land scarcity for food crop production. In some cases, farmers do not own the land and what they can cultivate is dictated by the landowner. The perceived and actual financial benefit and food have been the main sources of motivation for farmers engaging in the MTS not only at our study area but also in other parts of Ghana [16,17,39,40] and even in Sudan [41].

Within the socioecological systems, there is indeed a resource system, resource units, governance system and resource users [24]. In this study, the resource system is the forest biome, which is the habitat for many plant and animal species. The resource units include tress and soil, animals and medicinal plants. The governance system are the rules governing the MTS, which include demarcation of degraded forestland to farmers who express their interest in writing, prohibition of burning and application of weedicides and strict adherence to tree planting. The resource users include participating farmers, the communities, traditional authorities and the government. The farmers obtain food crops from using the relatively fertile degraded forestland and, if things go according to plan,

they will benefit from the trees they plant (40%) when the forest is thinned. The community as a whole will benefit from these cumulative tangible rewards that individual farmers receive. In addition to the 5% allocated to the community directly, the people will continue to benefit from non-tree forest resources such as mushrooms, bushmeat and medicinal plants as well as intangible benefits such as purified air and climate mitigation by the forest [37,42]. As mentioned, the traditional authorities will also receive their share (15%) and the government of Ghana will have its monetary share (40%) and perhaps meet part of its commitment to COP 21 and SDGs 13 and 15.

Regarding forest potential for mitigating climate change, it is argued that natural forest regrowth is better than tree planting [11]. But where the causes of deforestation are endemic socioeconomic activities, such as illegal logging and encroachment on public forests, tree planting, particularly the MTS, has greater potential for restoration than natural regrowth. Although there is no clear policy objectives and strategy on climate change mitigation of the MTS [16], there is no doubt that restored forest will sequester CO₂ because the plantation will be thinned systematically [19], after which resprouting and natural regrowth are expected. Thinning reduces competition for nutrients at the same depth, which enhances the growth of same tree species [43]. However, to ensure that MTS-established forest reserve provides climate mitigation services, thinning should be based on ecological consideration.

Ostrom [24] argues that when the cost of managing a resource is lower than the perceived benefits, users (actors) will invest in self-organising. Many farmers perceive the potential benefits and are investing their resources in the MTS to make it successful. But there are times when people, and even the Forest Commission (FC), default on the rules. While some farmers are not able to plant trees as required, the FC also fails to release the land and provide adequate saplings to farmers on time. Although some have argued that natural climate solutions (NCSs) are cheap [2,3], it is not easily affordable to the government and some people to invest and self-organise. Some farmers really want to but they do not have the funds and the government is defaulting on its own promise (policy) of providing saplings to farmers not because it perceives that the benefit of the MTS is lower than the cost of investing in it but because the economy is struggling. Where the government that vowed not to seek assistance from the International Monetary Fund (IMF) due to the often associated unfavourable conditionalities had to ran back to the IMF for bailout to avoid economic meltdown [44], financing reforestation becomes least of its problems and an opportunity cost.

Further, translocal practices of visits and remittances have impacted the MTS. The MTS requires financial capital and or sheer strength without which many farmers are not able to plant and nurture trees effectively. Wiersma [38] has also reported that some farmers are not engaged in the MTS because of inadequate financial resources. To clear degraded forest reserve with cutlass is a tedious work and to cultivate it without burning is quite challenging. So, if a farmer does not have the required brute force, s/he needs to have money to engage farm labourers. This is where remittances play crucial and enabling role for translocal household to engage effectively in the MTS. Specifically, cash remittance as a teleconnection between migrants and the left behind is impacting on the MTS at the area of origin. Some migrants also visit their communities of origin to work on the farm and engage in the MTS, which corroborate the argument that migration does not “uproot” people from one place and plant them in another place [21,45,46] because people usually do not forget where they come from or lose awareness of where they are.

6. Conclusions

The aim of this article is to understand the role of translocal practices of visits and remittances on natural climate solutions (NCSs) though reforestation under the Modified Taungya System (MTS) as a socioecological system. The findings point to the fact that there are interdependencies between the people and the forest. While the forest is being exploited for energy for cooking, supplementary protein sources and medicinal plants and fruits, people are also striving to keep the forest in shape through reforestation under

the MTS. This human–forest interaction is affected by translocal practices of visits and cash remittances, which enable many migrant households in the community of origin to engage effectively in agroforestry under the MTS. The people-centred reforestation policy encourages even migrants to engage in restoring the forest and creating NCSs in the area of origin.

Every tree-planting exercise is an attempt to provide a natural climate solution. However, for the restored forest under the MTS to provide climate mitigation services, thinning should be carried out based on ecological consideration and not on economic reasons. If the economic reason outweighs the ecological consideration for thinning, the forest would be degraded as quickly as it was restored.

It is important to note that NCSs are neither cheap for the government nor many of the local people: The Forest Commission (FC) could not provide adequate seedlings to farmers on time and some farmers also lack adequate money to engage effectively in the MTS. This does not in any way suggest the NCSs are more expensive than engineering pathways. Rather, this is an indication that in developing countries like Ghana, it should not be taken for granted that NCSs can be carried out easily. There is a need for funding for NCSs to be successful as is evident in the role cash remittances play in ensuring that some farmers perform better in the MTS.

Future studies could use and enhance our conceptual framework by investigating the impact of external factors such as market forces, global politics and or climate change on the translocal socioecological systems. Also, studies could investigate how the negotiations and linkages between the various actors (FC, farmers, migrants and the community) in the MTS actually contribute to local social control over forest resources. Finally, future studies could focus on the demographic characteristics of migrants to investigate whose translocal relations are most fruitful for the MTS.

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