INTERNATIONAL TROPICAL TIMBER ORGANIZATION

Highlights of the month

RED-PD093/12Rev.3(F)

ADVANCING REDD+ IN GHANA: PREPARATION OF REDD+ PILOT SCHEMES IN OFF-

Approval Level: Project Manager

TitleADVANCING REDD+ IN GHANA: PREPARATION OF REDD+ PILOT SCHEMES IN OFF-RESERVE FORESTS AND AGRO-FORESTS

Serial Number12

Host Government: GH

Executing Agency: GHANAIAN NATIONAL REDD+ SECRETARIAT

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Executing Agency's full name:

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Highlights of the month

Version:12.1

Date:22/04/2014

Approval Level: Project Manager

Commencement and/or Completion of major activities:

The following activity was completed:
Activity 2.1: Study the potential effects of REDD+ implementation on local peoples existing land use practices and their control over natural resources.

During the period covered by this highlight, ITTO conducted a Project Monitoring Mission and the Second PTC meeting was held in Kumasi.

Preparations for Activity 3.2 (Workshops for the sharing of results and conclusions of analytical studies) and Activity 3.3 (Publication of studies results and dissemination through ITTO) started.

Summarize major progress and achievements:

The final report for Activity 2.1 is attached.

The aim is to understand the potential implications of REDD+ implementation for livelihood, required changes in farming practices and conflicts in natural resource use at the forest or farm level in Ghana using six project communities as a case study. The purpose is also to provide information on farmers perception about REDD+ with an aim to contribute to Ghanas REDD+ strategy designs and formulations.

The key findings from the analyses are that under social asset category, enhanced social relationship is expected by farmers in all the study communities, while under the financial asset category, increased savings are expected that are likely to result from an increase in financial institutions to accommodate both direct and indirect funds to be created through REDD+. Although not mentioned, climate change mitigation effect from increase in trees on farmlands from REDD+ activities is expected.

On the potential negative effect, the perception of farmers is that reduction in food and cash production is expected from adoption of low carbon emitting farming practices. Although this may not be the reality, as results of Rainforest Alliance experiments with shade-tolerant cocoa varieties show the opposite. Also expected is increase in crop pests and diseases on farmlands from increase in tree cover on these lands. Potential conflicts in relation to natural resource use are use of agricultural lands for crops production, instead of planting trees for more carbon, presence of trees on farmlands that are likely to attract loggers leading to destruction of food crops, and confrontation with loggers and reduction of trees on farmlands.

Summarize major progress and achievements:

Important strategies to overcome potential negative effects of REDD + implementation are woodlot establishment for charcoal and fuel wood production, planting of shade tolerant crop varieties and non-shady trees on farmlands. Thus, a combination of land-sharing (agriculture with biodiversity elements) and land-sparing (agriculture spatially separated from biodiversity/conservation landscape elements) is proposed. The legal, property rights and institutional implication of such arrangements will have to be thoroughly assessed in the design of the REDD+ strategies.

The second PTC meeting was held on February 28, 2014. The minutes of the second PTC meeting is attached. The PTC meeting was held in conjunction with ITTO's project monitoring mission. A brief report of the field visit during the monitoring mission is attached.

List of products/outputs (reports, publications, maps, guidelines etc.):

Damnyag, L., Oduro, K.A., Foli, E.G. 2014. Analyses of potential livelihood outcomes, farming practices and conflicts in natural resource use under a REDD+ implementation in Ghana. ITTO REDDES Project, Final Report. Kumasi, Ghana.

Difficulties/obstacles encountered:

The main difficulty relevant to project implementation has to do with the time period to fully implement activities 3.2 (dissemination workshop) and 3.3 (publications). The initial planned period between the finalization of all the research/study activities (end of month 11) and the publication and dissemination of the results (end of month 12) would not be enough to successfully accomplish the activities. There would be the need for an extension of project implementation period to fully accomplish activities 3.2 and 3.3.

Follow-up on PSC/PTC recommendations, ITTO monitoring visits:

Nothing to report

Annexes

Advancing REDD+ in Ghana: Preparation of REDD+ Pilot Schemes in off-Reserve Forests and Agro forests

ITTO project RED-PD 093/12 Rev. 3 (F)

Technical report on:

Analyses of potential livelihood outcomes, farming practices and conflicts in natural resource use under a REDD+ implementation in Ghana

Lawrence Damnyag, Kwame Antwi Oduro, Ernest G. Foli

Forestry Research Institute of Ghana, Kumasi, Ghana

February 2014

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Swiss Confederation

Federal Departement of Economic Affairs, Education and Research EAER
State Secretariat for Economic Affairs SECO

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Acknowledgements

This is the report of Activity 2.1: Study the potential effects of REDD+ implementation on local people's existing land use practices and their control over natural resources, of the ITTO project on 'Advancing REDD+ in Ghana: Preparation of REDD+ Pilot Schemes in off-Reserve Forests and Agroforests'. It is implemented in Ghana by CISR-Forestry Research Institute of Ghana, jointly with researchers at the Bern University of Applied Sciences, Switzerland; Kwame University of Science and Technology, Kumasi, Ghana and the Climate Change Unit (CCU) of the Forestry Commission of Ghana.

We would like to thank Oliver Gardi and Angela Deppeler, at the Bern University of Applied Sciences, Switzerland for the valuable comments in improving earlier draft of this report. Emmanuel Asiedu-Opoku, Richard Adjei, Kwaku Asumandu, and Sarfo Mensah at the Forestry Research Institute of Ghana, Kumasi are also thanked for the field assistance with the data collection and entry.

The report has been prepared in collaboration with the International Tropical Timber Organization (ITTO) and with the financial support of the Swiss Confederation through the State Secretariat for Economic Affairs (SECO).

1.0 Introduction

Reducing emissions from deforestation and forest degradation (REDD+) mechanism is an international effort to mitigate climate change effects (Agrawal et al. 2011). REDD+ mechanism entails a set of processes and measures through which financial incentives are to be offered to tropical forest countries for demonstrable reductions in GHG emissions from deforestation (the conversion of forested to non-forested land), forest degradation (reductions in forest quality, particularly with respect to its capacity to store carbon), and to address the role of conservation, sustainable management of forest and the enhancement of forest carbon stocks in these countries (Agrawal et al. 2011; UNFCCC, 2010). REDD+ mechanism is likely to affect the livelihood of poor people (IEED 2011) since most of them depend on forests (FAO, 2011).

Whereas REDD+ incentives aim to support forest conservation and help to secure services provided by forests in addition to carbon storage and sequestration, potential social impacts, risks, conflicts and required changes in farming practices should also be recognized. Potential negative impacts arising from REDD+ implementation could include, displacement of land use pressures to other parts, interference with tenure rights of the poor, negative impacts on biodiversity and livelihood (Jagger et al, 2010). If REDD+ would be effective in mitigating climate change, the potential positive and negative impacts (Bell et al. 2012) need to be identified. Governments and other actors implementing REDD+ policies and activities should be informed about these possible outcomes, so that they could use that evidence to revise and improve the policies (Agrawal et al. 2011). Additionally, information on the potential positive and negative impact could also be important inputs in the assessment of social performance and cost effective impacts of REDD+ projects (Richard and Panfil, 2011)

The need to clearly understand these potential positive and negative effects in order to help in the development of feasible REDD + strategies for Ghana have been highlighted in the Readiness Preparedness Proposal (R-PP) and the (R-PIN) documents (Bamfo, 2010; 2008). Some of the challenges requiring the necessary attention include, i) reform of tree tenure regime in order to revitalize forest resources outside the official state reserves; ii) environmentally inappropriate technologies in agriculture, particularly the smallholder sector; iii) agricultural expansion and fuel wood harvesting, charcoal production, illegal logging, wildfire and biomass burning. Others are avoiding negative social implications that might arise from REDD+ implementation due to challenges such as effects on food prices and limited market access to rural poor. However, the identification of these effects on the ground, including farm households' perception on such challenges is yet to be fully understood.

With the information on the need for economic and social implication of REDD+ implementation to be clearly understood in advance, it is important such potential impacts on local communities and their economies are evaluated to aid the understanding. These potential impacts could include impacts on the well-being of people who live and work in the REDD + project areas; the required changes in farming practices (e.g. farmland intensification, agro forestry etc.) and likely conflicts in the natural resource use. Evaluating these local welfare impacts and changes in farming practices and conflicts in natural resources use are critical for understanding the broader social implications and long-term political feasibility of REDD+. More importantly, project developers, donors and relevant certifying bodies such as the Climate,

Community & Biodiversity Standards (CCBS), Voluntary Carbon Standard (VCS), and Plan vivo (PV) will need to know the outcomes of their projects and what tradeoffs between conservation and livelihoods are associated with those outcomes.

This work posits that the success or failure of REDD+, at any scale, depends on the possibility of designing interventions that do not harm local populations, and at best lead to favorable joint outcomes of reduced net carbon emissions and improved rural livelihoods**.** This study is a report on activity 2.1 of the ITTO project RED-PD 093/12 Rev. 3 (F)-Advancing REDD+ in Ghana: Preparation of REDD+ Pilot Schemes in off-Reserve Forests and Agroforests**.**

The aim is to understand the potential implications of REDD+ implementation for livelihood, required changes in farming practices and conflicts in natural resource use at the forest or farm level in Ghana using six project communities as a case study. The purpose is also to provide information on farmers' perception about REDD+ with an aim to contribute to Ghana's REDD+ strategy designs and formulations.

2.0 Theoretical background

The analysis in this work is based on the following theoretical concepts- the livelihood framework, cost benefit analysis, auction theory and conservation contracts and the framework for identifying potential forest conflicts under REDD+ implementation.

2.1 Livelihood framework

A livelihood comprises the capabilities, assets and activities needed for a means of living (http://practicalaction.org/livelihoods-4). It is sustainable when it is able to cope with and recover from shocks and stresses, enhance its capabilities and assets and provide sustainable opportunities for the next generation. The sustainable livelihoods approach considers vulnerabilities as the main factor that shapes how people make their living, choosing risk-adverse strategies. The level of vulnerability of an individual or community is determined by how weak or strong their livelihoods are, what occupational activities they are engaged in, the range of assets they have access to for pursuing their livelihood strategies and the strength and support of the social networks and institutions that they are part of or which have influence over them (Figure 1).

One important factor that influences the choice and strengths of the livelihoods that people pursue is the range of resources or assets that people are able to access and use. Certain components of these assets required to make a living can be classified under five main groups as follows.

- Natural (N) - soil, water, forest, environnemental assets, etc
- Financial (F) -sources of income, assets which can be traded or sold, savings, financial services
- Physical(P) - houses, schools, clinics, roads, ploughs, producer goods accessible by community, etc
- Human (H) - health, skills, education, knowledge, confidence, etc

- Social (S) - family links, groups, support networks, leadership, influences over political decisions, conflict (Figure 1)

The sustainable livelihoods framework indicates the different aspects of peoples' vulnerability and point out the social, political and economic structures and processes which influence vulnerability.

From the sustainable livelihoods framework; the social (S), Human (H), Natural (N), Financial (F) and Physical (P) assets, indicators and copying strategies were employed in this study for the design of a checklist of issues for the focus group discussion with farmers in the study communities (Figure 1, Annex 1).

2.2 Cost-Benefit analysis

Cost-benefit analysis (CBA) involves the totaling up of equivalent money value of the benefits and costs of a project to its target beneficiaries. The purpose of this summation is to arrive at a conclusion on the desirability of the project. In order to get to this conclusion, all aspect of the project, positive and negative, must be expressed in terms of common units, which is most conveniently in money. These benefits and costs are not only expressed in terms of money value, they are also expressed in terms of money value at given point in time. This is done to avoid differences in value of money at different points in time due to inflationary effects. In the application of CBA in this work, only benefits and costs data on farming was considered. Historical data on such activities as well as future ones were not considered. Other land use data of farmers were not also considered basically due to budgetary and time constraints in procuring such data.

2.3 Auction theory and conservation contracts on farmlands

According to Macfee and McMillan (1986), auction is a market institution with clear set of rules for determining resource allocation and prices on the basis of bids from participants in the market. Awarding contracts using competitive bidding is a method frequently used to obtain goods and services that do not have a well-established market (Latacz-Lohmann and Van der Hamvoort, 1997). In the award process, the buyer announces a contract for the procurement of a specified item and calls for bids from potential market participants. Auction process has long been used in government procurement contracting. For instance, the U.S. Department of Agriculture uses this process to award conservation (land retirement) contracts on competitive bidding basis (Latacz-Lohmann and Van der Hamvoort, 1997). Aside applying auctions in the conservation contracting in land retirement; it can also be applied in the management of environmental goods and services on private agricultural/farm lands. In doing this, farmers who are the sellers of these environmental goods and services on their farmlands, would be made to indicate in their bids the amount of incentive payment (or the percentage cost-share) required to adopt the conservation practice in question (Latacz-Lohmann and Van der Hamvoort, 1997). It is important to point out the application of auction theory in conservation contract is feasible based on two reasons. That is, i) the item being traded, provision of an environmental good/service on

farmlands, is a public-type non market good with no standard value; ii) information asymmetry is present in the process where farmers are more knowledgeable than the conservation experts, how participation in the program would affect their production plans and profits. On the other hand, they lack knowledge about the potential value of natural resources in the wider national and international markets. This is one theoretical advantage of auctions since it enables participating farmers to manage uncertainty about the value of the environmental good/object being sold or purchased. Based on this theoretical analysis, an auction was designed and administered to land owners in the study communities (see Annex 1)

2.4 Framework for identifying potential conflicts under REDD+ implementation

This framework is a preliminary predictive one built to identify possible sources of impairment that may result in conflict over management of forests and natural resources under REDD+ (Patel et al. 2013). It is developed from literature, mainly on Glasl's (1999) definition of conflict that is further developed by Yasmi and Colfer (2010), as a situation in which one actor or group impairs the activities of another because of different perceptions, emotions and interests. Based on the categorization by Yasmi et al. (2012) of potential sources of impairment as: underlying (e.g. contested and overlapping claims of tenure) and direct (e.g. loss of access by communities), the analytical framework in question was developed consisting of nine possible sources of impairment as the possible sources of conflict in REDD+ implementation. The nine conflict sources include; a) access and use restriction, b) benefit distribution, c) competing demands, d) conflict management capacity, e) leadership, f) legal and policy frameworks, g) participation and information, h) quality of resources, and j) tenure security.

The focus of the framework is on sub-national potential conflict, and based on internal issues (e.g. decision making within the community), and external levels (e.g. laws and regulations regarding community rights). The developed analytical framework was tested in three REDD + pilot project sites in Nepal. The sources of conflict that this framework was used to detect in these REDD+ pilot sites were issues related to benefit sharing that have been the main drivers of conflict prior to REDD+. Although, this frame work has some limitations in its scope and precision, it is useful for policy makers and practitioners involved in REDD+ strategy designs. The sources of conflicts identified in this framework were used to prepare the check list of information for the focus group discussion data collection for this study (see annex 3)

2.5 REDD+ in Ghana and activities for viable REDD+ strategies

Following the three phase approach for REDD+ mechanism development and implementation (Angelsen et al., 2009), Ghana with financial support from the Forest Carbon Partner Facility of the World Bank, has reached the second stage. Towards the development of viable strategies to move into the third stage, a number of activities are being undertaken. Among these, is the development of REDD + registry (data management platform that integrates technology, policies, and operational procedures to document, approve and track the development, compliance, performance, purchase, and retirement of emissions reductions (or removals)

through either national, regulatory, or voluntary markets or systems)(Asare et al. 2013). For this, setting of baseline and putting in place an effective Monitoring, Reporting and Verification (MRV) system have been done. Pilot projects have also been identified, although they are yet to be implemented. Earlier, detailed analysis of Ghana's REDD+ architecture including the policy, legal and technical requirement have been done (Asare et al. 2013). So far, these and other activities (e.g. the formulation of the new Forest and Wildlife Policy, The Ghana-European Union (EU) Voluntary Partnership Agreement (VPA) initiative, the Land Administration Project (LAP), etc.) in other sectors of the economy have helped in the development of important strategies in the political and institutional, technical and social and economic areas for REDD+ in Ghana. For REDD+ projects in Africa, Mbow et al. (2012) have already recommended some of these strategies. They include understanding of the active drivers and processes of forest emissions, incorporate REDD+ in forest management, demonstration activities to establish a basic stock of practical experiences, national forest and carbon mapping to establish a baseline, enhance tenure rights through formal legal acknowledgement of local resource rights and sharing of benefits from forests, etc.

3.0 Methodology

3.1 Study area

The study was conducted in three administrative districts in two communities each. These districts and the communities included Aowin Suaman (Adonikrom and New Yakasi) in the Western region, Asikuam-Odoben Brakwa (Bedum and Brakwa) in the Central region and Kintampo North Municipal (Dawadawa no.1 & 2,Attakura and Tahirukura) also in the BrongAhafo region (Table 1 and figure 2a &2b). Communities in the BrongAhafo region are in the drier part (forest savannah transition zone), while the remaining study communities are in the wetter (high forest zone) part of Ghana. As in Figure 2a &2b these study sites are potential REDD+ project areas

Table 1: Communities and number of farm households engaged in the interview

Community	Aowin Suaman district in Western region	Asikuam-Odoben Brakwa district in Central region	Kintampo North Municipal district in BrongAhafo region
Adonikrom	38	-	-
Attakura	-	-	23
Bedum	-	33	-
Brakwa	-	45	-
Dawadawa No. 1	-	-	3
Dawadawa No. 2	-	-	35
New Yakasi	37	-	-
TahiruAkuraa	-	-	18
Total	76	78	79

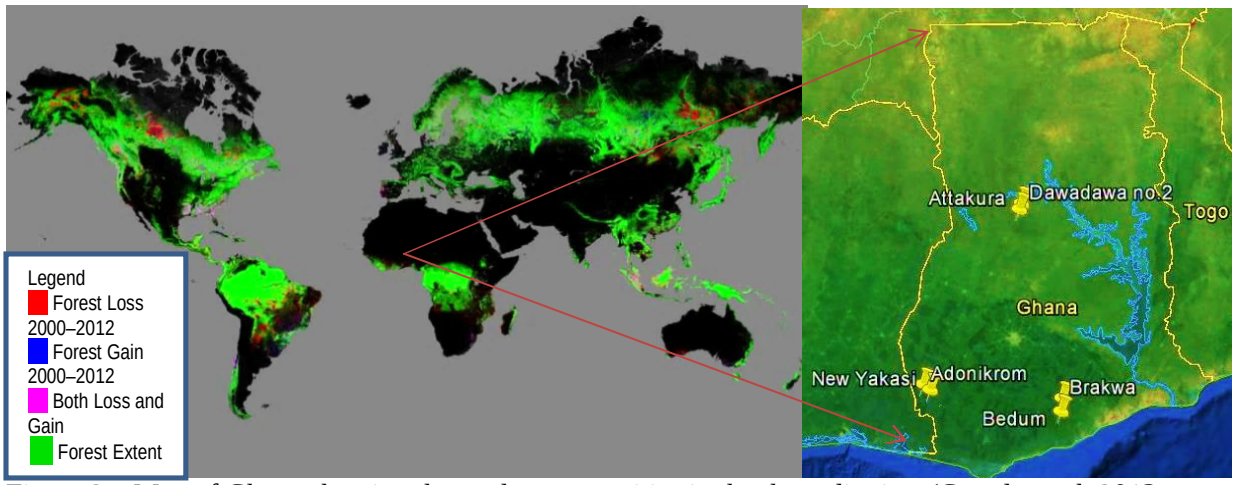

Figure 2a: Map of Ghana showing the study communities in the three districts (Google earth 2013; Hansen et al. 2013)

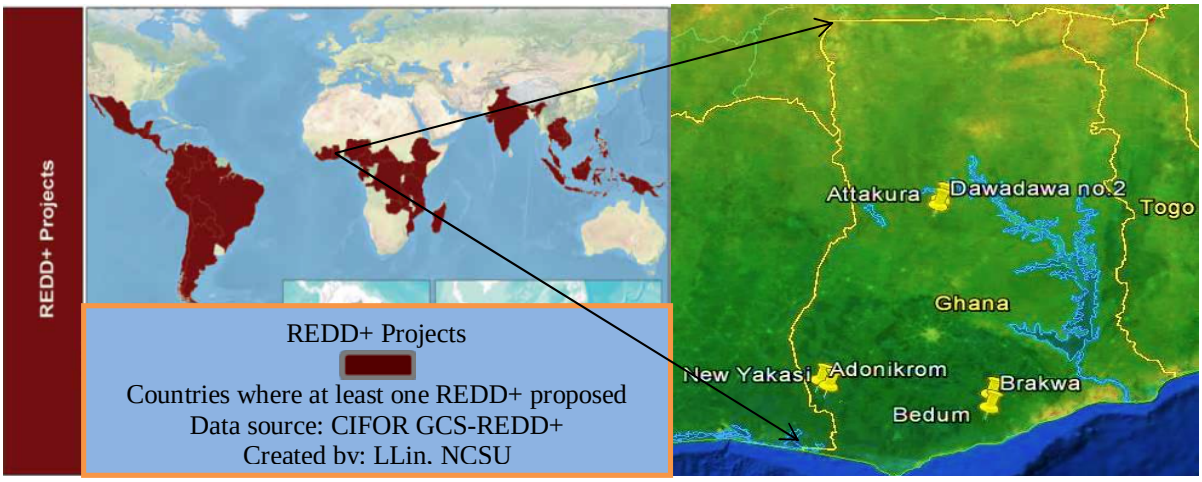

Figure 2b: Map of Ghana showing the study communities in the three districts (Google earth 2013; Jagger et al. 2010)

3.2 Questionnaire design, sampling and data collection

Individual interview questionnaire was prepared from literature and pretested in one community in the study site. For this questionnaire, the sample units were the farm households in two communities each in the three district study sites. Selection of these farm households was based on the household heads. The housing units were systematically identified and household heads selected for the face-to- face individual interview in May 2013. With the focus group discussion that was also employed, a check list of issues to be discussed was first prepared from literature documents (Annex 3). On site in the study communities in the target districts, household heads were organized into groups (see Table 2) for the discussion on the issues. The group responses were then recorded on sheet of paper according to the check list.

For the auction data collection, a hypothetical REDD + intervention that involves inclusion of at least 20 trees on farmer's land was constructed. These farmlands included a hectare of cash crops, perennial crops and fallow land. Farmers who are land owners were identified in the study communities to participate in this auction exercise. These groups of farmers were made to indicate their bids (price for which they are willing to plant and maintain 20 trees on a hectare of land) on these types of land uses individually three times in a sealed envelope.

Table 2: Focus group discussion information collection schedule

Categories/activities for focus group discussions	Aowin-Suaman district	Asikuma-Odoben-Brakwa District	Kintampo north district
Average time for one group discussion	2.5 hours	1.5 hours	1.5 hours
Gender	Male - 5 Female - 2	Male - 8 Female - 3	Male - 10 Female - 5
Number of focus groups in the study communities in each district	4	4	3
Number of persons in each focus group	7	11	15

3.3 Data analysis

Quantitative and qualitative research data were collected in order to address the research problem identified in this work. While the quantitative data was collected through questionnaire surveys, the qualitative data was collect in focus group discussions (Table 2 and Annex 3).

The survey questionnaires were analyzed using frequency, graphs, averages on issues that community respondents were asked. These issues were socio economic characteristics, farming and livelihood activities, land use practices, perception on land use types that are low carbon emitting, likely effect on farmers for adoption of such land use types. Other issues discussed and information collected were revenues and cost information from the farm households farming activities. Farm households were also asked to indicate prices for which they would allocate portions of their farmlands for potential REDD+ intervention in the form of tree planting. Farmer-land owners were made to indicate a bid for a hectare of farmlands to be committed for these REDD+ conservation activities. The bids information was averaged for three rounds for each farmer and reported in boxplots. Other descriptive statistics involving means were obtained from the data and t test statistics performed to compare the bids among farmers in the different study communities in the three districts. The information collected in the focus group discussions were analyzed by identifying themes and clustering them under the assets categories indicated in the livelihood framework (figure 1) and the framework for conflict identification.

4.0 Results

4.1 Land uses and management practices among farmers

Land use practices

Land use practices in the study communities are varied. While charcoal production is dominant in the communities in the drier areas in the Kintampo North Municipal District, sand winning is

dominant in the Central region communities. Settlement expansion and road construction in the Western Region communities were common (Table 3).

Table 3: Prevailing land use practices in study communities in the three districts (numbers and percent of respondents)

Prevailing land use in the study communities	Aowin-Suaman in numbers(%) of respondents	Asikuma-Odobeng Brakwa in numbers (%) of respondents	Kintampo North Municipal in numbers (%) of respondents	Total number of respondents
Building	22(63)	7(20)	6(17)	35
Road construction	9(90)	1(10)	0(0)	10
Food crop (Plantain)	1(33.3)	2(67)	0(0)	3
Sand winning	1(8.3)	11(92)	0(0)	12
Charcoal production	2(3.3)	0(0)	59(97)	61
Animal rearing	1(25)	0(0)	3(75)	4

Land management practices

Among farmers in the study communities, soil and nutrient management in Aowin Suaman districts appears to be prevalent while use of synthetic fertilizer is prevalent among farmers in the study communities in the Kintampo North Municipal and Aowin-Suaman districts (Table 3). It is among farmers in communities in the Asikuma-Odobeng Brakwa district that the use of pest and disease control as a form of land use management appears to be prevalent (Table 3).

Table 3: Prevailing land use management in communities in the study districts (number and percent of respondents).

Current land use management	Aowinsuaman in count (%) of respondents	AsikumaOdobengBrakwa in count (%) of respondents	Kintampo North Municipal in count (%) of respondents	TOTAL
Soil and nutrient management methods and practices that increases organic nutrient inputs, retention and use	48(57)	4(5)	33(39)	85
Use synthetic fertilizer	68(41.2)	26(16)	71(43.0)	165
Pest and disease control	66(41)	69(43)	27(17)	162
Harvesting, processing and supply chain	10(40.0)	2(8.0)	13(52.0)	25
Regular weeding	0(0)	27(68)	13(33)	40

4.2 Analyzes of farmers' revenue from existing farming practices

The analysis of farmers' revenue from existing farming practices is done mainly in three areas, namely; gross revenue, net revenue and inputs use.

4.2.1 Analyses of gross revenue of farmers from existing farming practices

The analyses of the gross revenue of farmers from their agricultural lands, excluding the inputs cost, show a dominance of cocoa production (cash crop) in the wet zone; as well as rice and yam (food crop) production in the dry zone in study areas (Table 5 and 6).

Table 5: Quantities of leading crops produced and the corresponding gross revenue obtained by farmers in the study communities in the three districts (based on their interview answers

	First farming season					Second farming season				
District/crop	Farmers(no)	Quantities produced			TR(¢)	Farmers	Quantities produced			TR (¢)
		Bags	Kg	Metric tons			Bags	Kg	Metric tons	
Aowin/cocoa	73	3535	226240	226.24	741852	71	1042.75	66736	66.74	222328
Asikuma/cocoa	74	821	52544	52.54	164857	52	219.5	14048	14.05	42291
Kintampo/Rice	41	1057	86264	86.3	87942					
Kintampo/yam	40	*86602	216505	216.5	433010					

*Yam is in pieces/Numbers. One bag of paddy rice = 82Kg, 100 tubers of yam=250Kg (MDA, 2010). TR= Total revenue. Exchange rate 1US$=GH¢1.97 at May 2013 (www.bog.gov.gh)

Average cocoa revenue (gross) per farmer in the Aowin-Suaman district (study communities) is GH¢10162 in the first farming season and GH¢3131 in the second season, while it is GH¢2228 and GH¢813 in both seasons respectively in the Asikuma-Odobeng Brakwa district study communities. For the food crops among the study communities in the Kintampo North districts, average revenue per farmer is GH¢10825 for yam, and GH¢2145 for rice. These are only for one season, because these crops are not cultivated in the two seasons due to dry nature of this area (Table 6)

Table 6: Gross revenue analysis of cash and food crops of farmers in the study communities in the three districts

Asikuma		1st farming season				2nd farming season				
Crop	Plot area (hectares)	farmer (number)	Total revenue(₵)	Average revenue/ farmer(₵)	Average revenue/ ha	plot area (hectares)	Farmer (number)	Total revenue(₵)	Average revenue/ farmer	Average revenue/ha
Cocoa	214.8	74	164857	2228	767	414	52	42291	813	102.15
Cassava	21.588	21	7484	356	347	46.5	17	2120	125	45.59
Maize	2.72	4	1365	341	502	49	5	931	186	18.99
Plantain	2.8	4	28028	7007	10010	380	3	4096	1366	10.78
Palm	1.6	2	120	60	75					
Kintampo		1st farming season				2nd farming season				
Maize	34.4	25	20956	838	609.186	11.2	8	7969	996	711.52
Cassava	1.6	2	340	170	212.5					
Yam	81.6	40	433010	10825	5306.49					
Rice	77	41	87942	2145	1142.10					
Pepper	2	3	27367	9122.4	13683.5					
Ground nut	6.4	9	7590	843	1185.93					
Beans	5.4	7	7518.4	1074	1392.30	3.6	2	237	118	65.83
Okro	0.6	2	306.4	153.2	510.67					
Aowin-suaman		1st farming season				2nd farming season				
Cocoa	484	73	741852	10162	1532.75	486.8	71	222328	3131	456.71

As it appears (Fig 3), gross total revenue farmers obtained in a year involving all crops cultivated is generally higher in the study communities in the Aowin-Suaman district, although only cocoa farming revenue was included in the computation. Revenue from communities in the Kintampo North Municipal district follows and those obtained in communities in the Asikuma-Odobeng Brakwa appears to be the least. Exchange rate 1US$=GH₵1.97 at May 2013 (www.bog.gov.gh)

The dominance of gross revenue earnings of farmers in communities in the Aowin-Suaman district appears confirmed with the highest average revenue (i.e. total gross revenue /farmer) of GH₵12855.73, followed by GH₵5830.44 in Kintampo communities and the least, GH₵3539.32 in the Asikuma-Odobeng Brakwa communities. The large standard deviation values in Aowin-Suaman and Kintampo communities probably is an indication that these gross revenues from crop production and access to land resources in these communities are not evenly distributed among the farmers (Table 7).

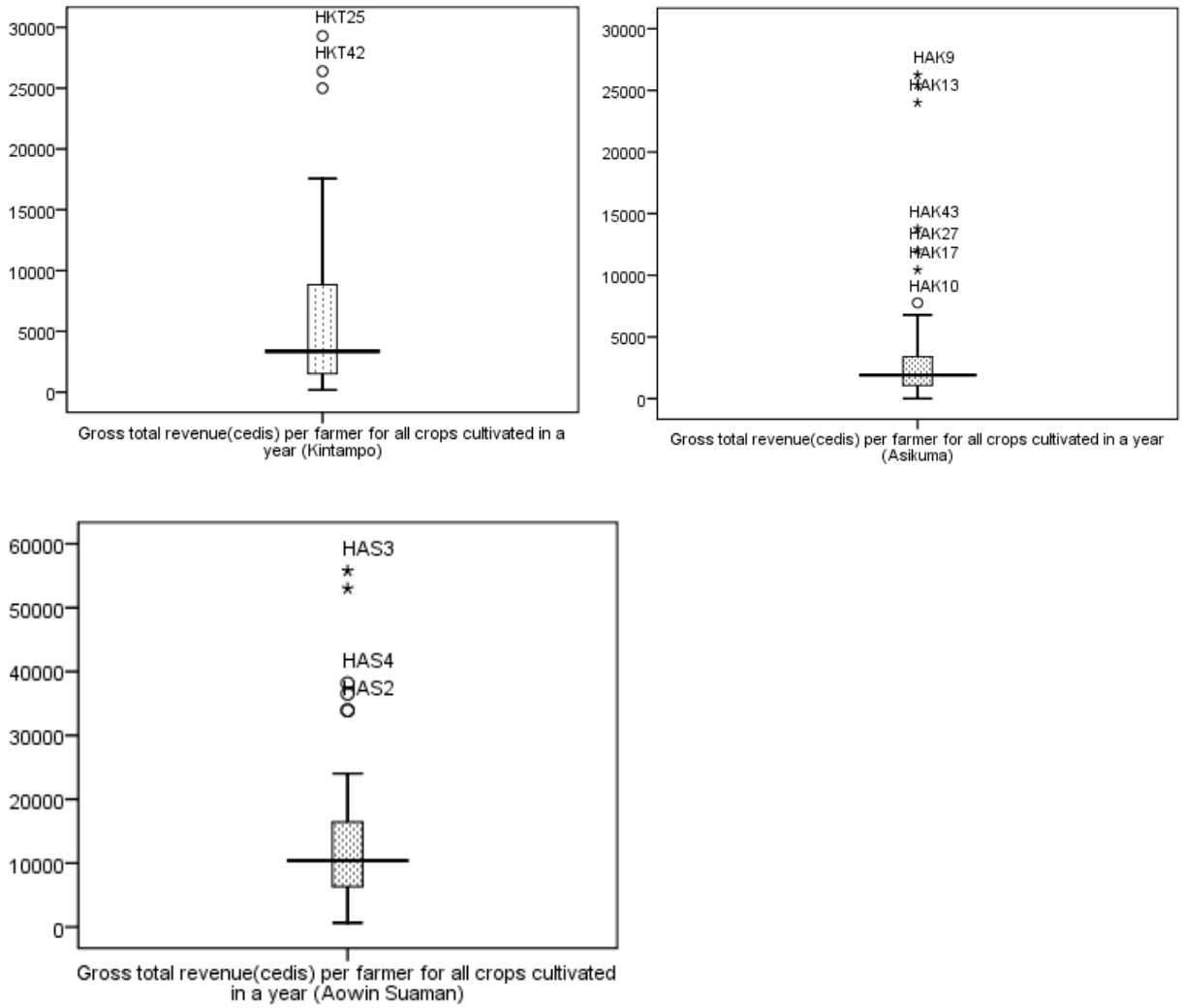

Figure 3: Gross total revenue of individual farmers in the study communities in three districts for two farming seasons. Exchange rate 1US$=GH¢1.97 at May 2013 (www.bog.gov.gh)

Table 7: Descriptive statistics of gross revenue of farmers for two farming seasons in the study communities in the three districts

District	Farmers (no.)	Min(GH¢)	Max(GH¢)	Mean (GH¢)	Median	Standard deviation
Aowin	75	636	55756	12855.73	10388	10720.94
Asikuma	71	3.2	26252.35	3539.32	1908	5285.7
Kintampo	79	177.6	29287.6	5830.44	3350	6224.18

4.2.2 Analyses of inputs use in existing farming practices

Labour inputs appear the highest cost element in the farming activities of farmers in all the study communities in the three districts. The next higher cost element is fertilizer both NPK and UREA, but appears dominant among farmers in communities in the Kintampo North Municipal

district as many more farmers report the use of these (Table 8). The use of pesticides appears higher than that of Herbicides among farmers in all the study communities (Table 8).

Table 8: Costs of inputs used in the food and cash crop production in the 1st and 2nd farming seasons by group of farmers in the study communities in the three districts

District/Season / crop	Hired labour(¢)	farmers (no.)	Fertilizer (NPK) (¢)	farmers (no.)	Fertilizer (UREA) (¢)	Farmers (no.)	Herbicide (¢)	farmers (no.)	Pesticide (¢)	farmers (no.)
Aowin/ 1st /cocoa	36416	71	102225	70	5014.2	9	7800	33	25723.	76
maize	4088	25							18.38	1
cassava	3235	19								
plantain	2408	14								
Asikuma/ 1st/cocoa	51414	62	18112	25			4819.2	43	9961.96	57
cassava	24754	31					902.4	23	514.64	9
maize	7461	14					182.4			
plantain	1354	3								
Kintampo/1st/yam	88608	72	9160	40	2342.4	12	8745.6	56	533.02	6
rice	41432.	59	7555	35	768.6	5	4838.4	50	183.1	3
maize	27814	40	4179	25	329.4	2	2371.2			
beans	8427	13	1338	8	73.2	1	547.2			
Aowin/2nd/cocoa	13694	44	6711	12			278.4	4	6524.9	41
maize	2884	22								
cassava	2132	17								
plantain	1931	14								
Asikuma/2nd/cocoa	239299	40	1844.15	9			854.4	20	2536.44	25
cassava	9405	17					201.6	8	73.52	2
maize	3526	8								
plantain	451	1								
Kintampo/2nd/ maize	5844	7	370.53	2	329.6	1	633.6	5	110.28	2
beans	100.32	1	329.36	1	205.85	1	115.2			
groundnut	150.48	1								
pepper	100.32	1								

Exchange rate 1US$=GH¢1.97 at May 2013 (www.bog.gov.gh)

4.2.3 Analyses of net revenue from existing farming practices

The net revenue (total overall revenue minus total overall cost) appears highest among farmers in communities in Aowin (Fig 4). The least net revenue value is recorded in Asikuma-Odobeng Brakwa, with an average net revenue value of GH¢1273.59 compared to the highest average value of GH¢11469.92 (Aowin) and GH¢3079.45 (Kintampo). Again, the high standard deviation value of 11260.33 point to an uneven net revenue distribution in Aowin compared to a likely even net revenue distribution among farmers in Kintampo North Municipal District communities with the lowest standard deviation value of 1051.97 (Table 10).

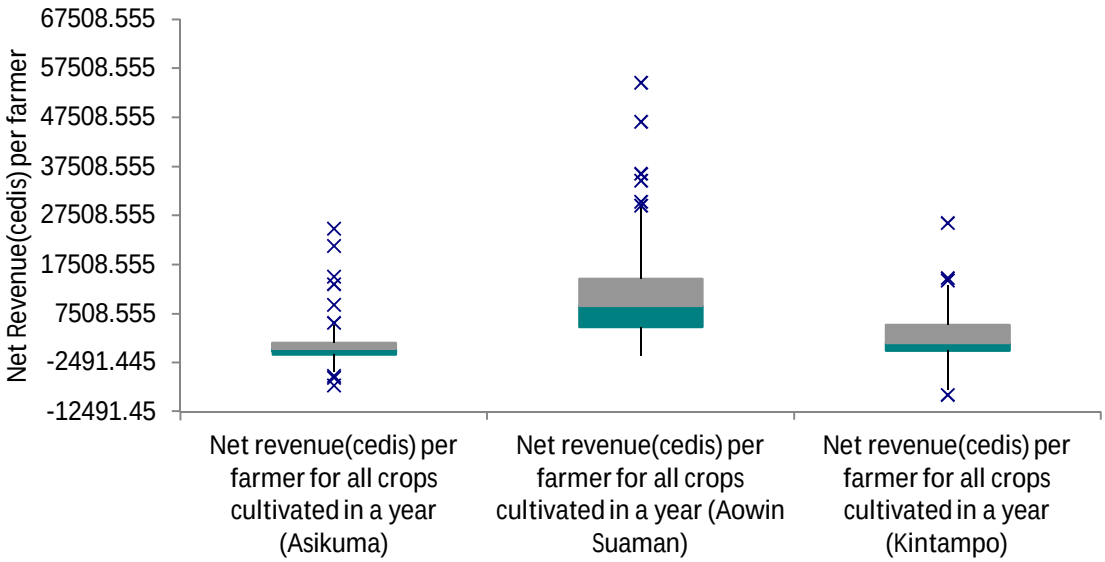

Figure 4: Net revenue of individual farmers in the study communities in the three districts for two farming seasons. Exchange rate 1US$=GH¢1.97 at May 2013 (www.bog.gov.gh)

Table 10: Descriptive statistics of net revenue of farmers in the study communities in the three districts

District	Farmers (no)	Min(GH¢)	Max(GH¢)	mean(GH¢)	Median (GH¢)	Standard deviation (GH¢)
Aowin	74	-1003.21	54668.84	11469.92	9174.98	11260.33
Asikuma	73	-7105.12	24882.82	1273.59	543.50	3062.96
Kintampo	79	-8975.7	26022.98	3079.45	1709.80	1051.97

4.3 Analyses of farmers' bids (GH¢) for potential conservation contracts on farmlands

Individual farmers' bids for potential REDD+ intervention on cash crop farmlands appears highest compared to those in the perennial and fallow lands in the Kintampo north municipal and Aowin-Suaman communities (Figure 5 and Annex 2). In the Asikuma-Odobeng Brakwa communities, the highest bid is in the fallow lands. Comparing the bids for the cash crop lands, Aowin-Suaman communities minimum and maximum bids are GH¢367 and GH¢70000, Kintampo North Municipal communities is GH¢600 and GH¢50000, and the Asikuma-Odobeng-Brakwa communities is GH¢50 andGH¢367. For the perennial crop lands, the minimum and maximum bids are GH¢1700 and GH¢15000; GH¢233 and GH¢36660; and GH¢50 and GH¢ 233 in Kintampo, Aowin and Asikuma-Odobeng study communities respectively. On the fallow lands, the minimum and the maximum bids are GH¢100 andGH¢1667, and GH¢167 and GH¢10000, GH¢50 and GH¢1500 in the same communities in the study districts respectively (Figure 5).

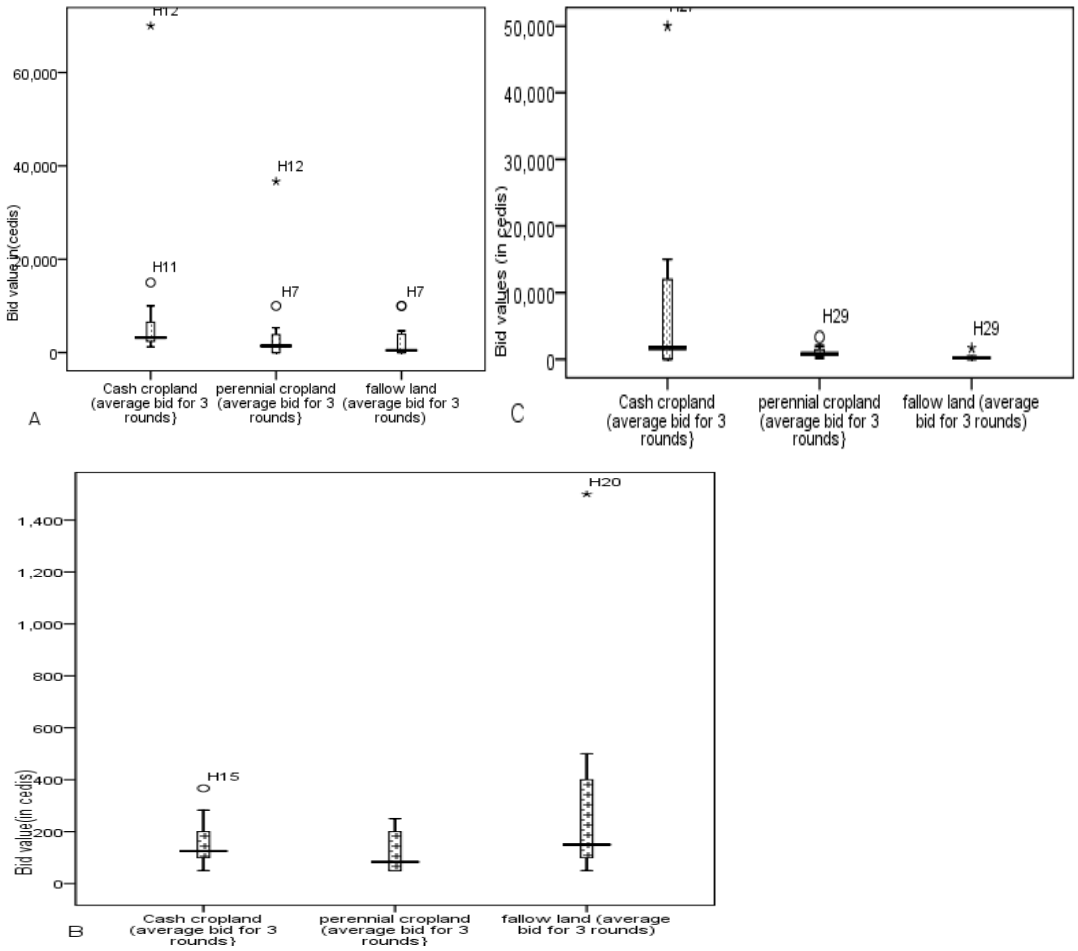

Figure 5: Individual farmer bid price (average of 3 rounds) for a hectare of cash crop, perennial and fallow lands in the Aowin-Suaman (A), Asikuma-Odobeng Brakwa(B) and Kintampo north municipal(C) study districts. Exchange rate: 1US$=GH¢1.97 at May 2013 (www.bog.gov.gh)

For the overall bids (average per farmer) among farmers in each of the study districts, Kintampo North Municipal communities record the highest mean bid of GH¢12616.67 for the cash crop farmland. In the same category, in the Asikuma-Odobeng Brakwa district, the mean value is GH¢160 and it is the lowest, because the mean value in Aowin-Suaman is GH¢ 9199.24 (Table 11). The mean bid for the perennial crop land is also higher than that of the fallow lands in two study districts-Kintampo and Aowin-Suaman. In the Asikuma-Odobeng Brakwa, mean bid for the fallow land is the highest, followed by that of the cash crop farmland and the perennial crop land which is the least (Table 11). The mean bid values between the study districts are not significantly different, except that of perennial crop lands between Kintampo north and Aowin-Suaman ($t(14) = -3.77$, $p= 0.002$) (Table 11).

Table 11: Average bid price of farmers for REDD+ intervention on an acre of cash, perennial and fallow land in communities in the study districts

Categories where bits were offered by farmers	Aowin		Asikuma		Kintampo		T test statistics for pairs of communities in the three study districts-AS, AOB and KN
	Mean (GH¢)	*N	Mean (GH¢)	*N	Mean (GH¢)	*N	
Cash crop (average bid for 3 rounds)	9199.21	14	160	10	12616.67	6	*(AS: AOB), t(22)=1.59, p=0.13 (AS:KN); t(18)= -0.38, p=0.71 (*KN:AOB); t(14)=-2.10, p=0.55
perennial crops (average bid for 3 rounds)	4665.5	14	123.4	10	1388.83	6	(AS:*AOB); t(22)=1.48, p=0.15 (AS:KN); t(18)=0.82, p=0.42 (KN:AOB); t(14)=-3.77, p=0.002
Fallow land (average bit for 3 rounds)	2575.07	14	326.7	10	447.33	6	(AS:AOB); t(22) =1.97, p=0.62 (AS:KN); t(18)=1.43, p=1.71 (KN:AOB); t(14)= -0.46, p=0.65

*AS is Aowin-Suaman district, *KN is Kintampo North Municipal district and *AOB is Asikuma-Odobeng Brakwa
*N is the number respondents.Exchange rate 1US$=GH¢1.97 at May 2013 (www.bog.gov.gh)

4.4 Potential effect of REDD+ funding to effect changes in farming practice and increase carbon stocks on farmlands

The least net revenue per farmer per annum in Asikuma-Odobeng Brakwa from cash (Cocoa) and food (rice and yam) crop farming is GH¢1273.59 (US$647), GH¢11469.92(US$5822.30) in Aowin Suaman and GH¢3079.45(US$1563.17) in Kintampo North Municipal. Although these net revenue earnings of farmers is observed at only one point in time and may not be accurate to compare with expected earnings from a REDD+ intervention, it is still important to make that comparison. This is particularly so when the net revenue per farmer per annum in cocoa growing area in the Aowin-Suaman district is exceptionally high (US$5822.30) compared to the average cocoa farmer's expected income of US$1500 (Mann et al. 2010). The conservative estimate by Mann et al. (2010) of net earnings from REDD+ intervention on cocoa farmlands in the Aowin Suaman district is US$200 per hectare per farmer. This estimate is approximately 29 times less than the net revenue from cocoa farming per the results in the Aowin-Suaman study district.

Although a further study may have to be done to provide an accurate comparison of net revenue earnings from cash (Cocoa) farming to that of REDD+ intervention, the present results show that more may be required from the REDD+ funds to enable farmers change their farming practices in a way that will reduce deforestation and increase carbon stocks on farmlands. This would hold in case agroforests are considered as forest as well This requirement of higher funds from REDD + intervention is reinforced by the auction results in the present study. As indicated, the amount a farmer would bid (mean-bid per farmer) for a cash crop farmland for REDD + intervention, is GH¢12616.67(US$6404.40) in Kintampo North Municipal study communities, GH¢ 9199.24 (US$4669.67) in Aowin-Suaman and GH¢160 (US$81.22) in Asikuma-Odobeng Brakwa, which in comparison to a REDD+ intervention is very high with the exception of the lower value in Asikuma-Odobeng Brakwa.

4.5 Analyses of potential effect of REDD+ implementation on livelihood

4.5.1 Livelihood activities of farmers in communities in study districts

While the livelihood activities vary from district to district, cash crop and food crop farming appear common for all communities in the study districts. However, some livelihood activities are peculiar to some districts. For instance, while charcoal production is highly practiced in the Kintampo north municipal, activity of cocoa beans purchasing offer/clerk is prevalent in Aowin-Suaman and Asikuma-Odobeng Brakwa study communities (Figure 5).

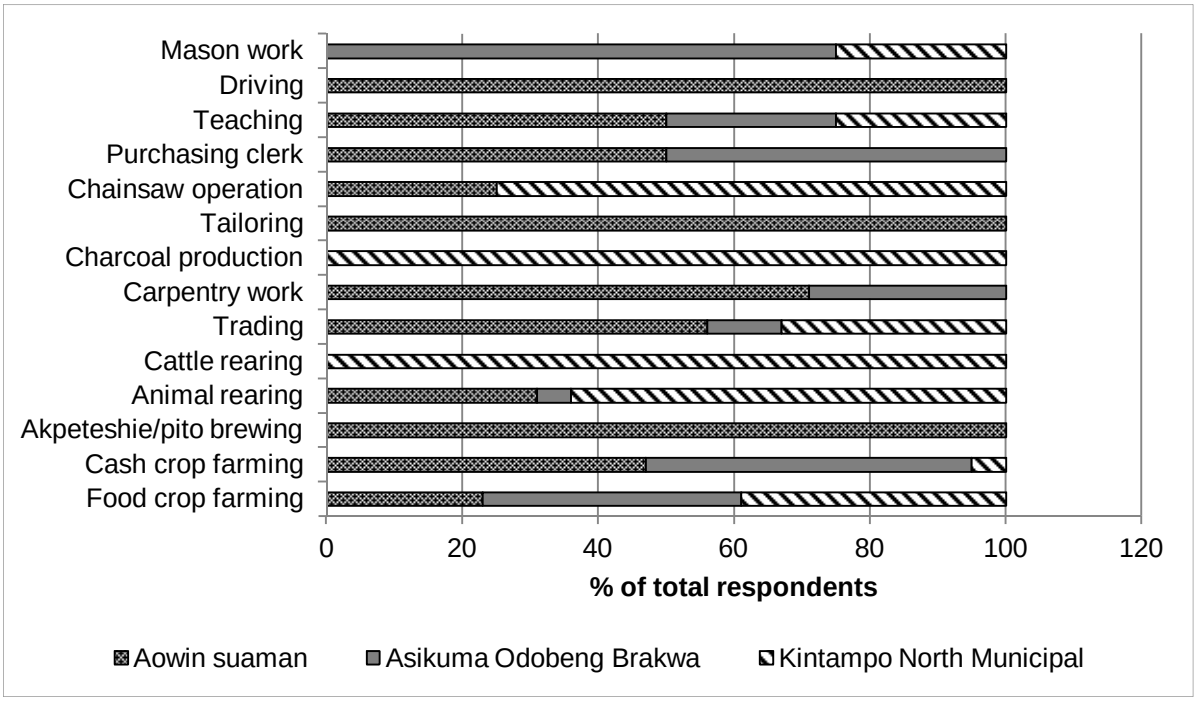

Figure 5: Livelihood activities in communities in the study districts

4.5.2 Farmers' perception on low carbon emitting land use practices and impacts on livelihood
Farmers in the study communities perceive conservation agriculture as the key land use practice that is low carbon emitting. This is followed by agroforestry. Among these farmers, the most important potential effects of the adoption of conservation agriculture on their livelihood activities (Figure 5) are reduction of quantities of food and cash crops produce (Table 4).

Table 12: Effect of adoption of conservation agricultural practice on livelihood in the study communities in the three districts (number and percent of total respondents).

Impact on livelihood of adoption of low-carbon emitting techniques?	Aowin Suaman number(%) of respondents	AsikumaOdobeng Brakwa(number (%) of respondents)	Kintampo North Municipal(number (%) of respondents)	TOTAL
Reduction of quantities of food crop produce	23(18.4)	42(34)	60(48.0)	125
Reduction in cash crop production	57(51)	54(48.2)	1(.9)	112
Tree planting reduces sunshine for cocoa	7(100.0)	0(.0)	0(.0)	7
Increase yield	1(20.0)	2(40.0)	2(40.0)	5
no effect	0(0)	0(0)	11(100.0)	11

4.5.3 Potential effect of REDD+ implementation on livelihood

Capital assets famers obtain from engaging in different livelihood activities
Capital asset is defined to include human, social, financial, natural and physical capital (Figure 2, annex 1). Through the different livelihood activities, farmers acquire these assets and utilize them in order to improve their living standards depending on the quantity and quality available. The types of assets farm households possess are the basics ones and are almost the same in all the study communities (Table 13).

Farmers' perception of potential favourable and negative effects on livelihood
For all the five livelihood indicators, there is potential favorable and negative effect on each of them from the REDD+ implementation in all the study communities (Table 14). In the social capital assets category, enhanced social relationship is expected by farmers in all the study communities, while under the financial asset category, increased savings are expected that are likely to result from increase in financial institutions (Table 14).On the potential negative effect, reduction in food and cash production is expected. Also expected is increase in crop pests and diseases (Table 15). The reason accounting for this increase is that, more trees on farmlands under a REDD+ intervention is likely to attract these pests and diseases.

Farmers' perception on potential conflicts in natural resource use

Likely conflicts to arise with use of natural resource are the felling of trees grown under REDD+ implementation and in the process damage food crops particularly in the Kintampo North Municipal communities. Others are use of agricultural lands for crops production, instead of planting trees for more carbon, presence of trees on farmlands that are likely to attract loggers leading to destruction of food crops (Table 14), and confrontation with loggers and reduction of trees on farmlands.

Table 13: Type of capital assets farmers obtain/derive from engaging in different livelihood activities based on results from the focus group discussion in the study communities in the three districts in Ghana

	Aowin-Suaman district		Asikuma-Odoben-Brakwa		Kintampo north Municipal district	
Type of capital assets	Units/quantity/tally	Remark/totals	Units/quantity/ tally	Remark/totals	Units/quantity /tally	Remark/totals
Social	Farmers Association: Abrabɔpa, Adɔyɛkuo, Nyamebɛkyerɛ, Church group, Drivers association	Poor social relationship, networks, associational and institutional linkages resulting from few number of organizations		Help one another in times of need; and in agriculture innovation adoption	Rice farmer Association Yam farmer Association Maize farmer Association	These organizations do not function effectively
Natural	Land, Own trees, Livestock, Housing plots	Most of these natural assets are used for agricultural purposes.	Land, Own trees, Livestock		Land, Livestock	Most of these natural assets are used for agricultural purposes
Human	Education Health	Most of them are engaged in farming activities and have low level of education and low level of health centres	Education Health		Education Health	Most farmers are engaged in farming activities and have low level of education and low level of health centres
Physical	House, Phone, TV, Car	Farmers have less physical assets to make life worth living for them	Houses, car Shops, motor bike Furniture, electrical gadgets		House, Phone, Bicycle	Inadequate physical assets to enhance effective and efficient work processes
Financial	Savings, Remittances	Low level of income has resulted in low level of personal savings. With this a few number of financial institutions are available in the community	Savings, Income from remittances		No credit union No income from remittances	They have low level of financial assets resulting in low level of savings and investment

Table 14: Indicate the potential positive effect of REDD+ Implementation on your capital acquisition (based on results of the focus group discussion in the study communities in the three districts in Ghana).

Type of Capital Assets	Nature of impact in Aowin Suaman district	Nature of impact in Asikuma-Odobeng-Brakwa	Nature of impact in Kintampo north municipal district
Social	➢ It will help increase available funds to cater for oneself and family ➢ It will increase household expenditure for gifts and transfers and reduce household income from remittances ➢ Quality social relationships, networks, associational and institutional linkages as a result of forming various organizations within the community	➢ We will be able to afford new innovations from Agriculture extension officers. ➢ Helping each other in time of needs(funeral and during sickness)	➢ Increase income and reduce burden ➢ We will form groups from the project and together we can afford equipment for our work (tractor) and other farm implements.
Natural	➢ Increase in the price of land. ➢ Increase in soil nutrients thereby increasing crop production ➢ There will be proper waste disposal minimizing diseases such as cholera ➢ Increase level of water bodies such as rivers ➢ Help maintain our forest reserve ➢ Increase in farming activities thereby minimizing other livelihood activities ➢ High security of household plots ➢ Increase in poor waste disposal	➢ Timber, rainfall, good air, non-timber forest produce and fertile land for our farming	➢ Help maintain our forest reserve ➢ Increase in soil nutrients thereby increasing crop production ➢ Small patches of land to be available for livestock ➢ There will also be proper waste disposal minimizing diseases ➢ High rainfall resulting in increased level of water bodies such as rivers.
Human	➢ Primary school net enrolment falls during rainy season. ➢ Positive primary school net enrolment and completion rates and also increase in literacy rate since more infrastructures will be established ➢ Reduce morbidity and mortality rates	➢ Enough money to take care of our children's education and health.	➢ There will be positive primary school net enrolment and completion rates since more infrastructures will be established and will result in high literacy rate ➢ Reduce mortality rate of the youth thereby creating more labour
Physical	➢ Possession of more items that enhance income. ➢ Possession of more personal consumption items	➢ Possession of more items that enhance income. ➢ Possession of more	➢ Possession of more items that enhances income. ➢ Provision of facilities and infrastructure in the community.

	➢ Access to infrastructure and utilities	personal consumption items ➢ Access to infrastructure and utilities	
Financial	➢ Reduction in the rate of borrowing but then increasing the rate of lending. ➢ Creation of more financial institutions will result in high level of savings and investment	➢ We will have enough money to save and even invest in other areas such as livestock and trading.	➢ Creation of more financial institutions will result in high level of savings and investment and also increase in other financial assets

Table 15: Indicate the potential negative effect of REDD+ Implementation on your capital acquisition (based on the results of the focus group discussion in the study communities in the three districts in Ghana)

AowinSuaman district	Asikuma-Odoben-Brakwa district	Kintampo north municipal district
➢ Reduction in quantities of output, both cash crops and food crops ➢ Increase in the general price of land ➢ Primary school net enrolment will fall due to high rainfall ➢ Increase diseases that affect cocoa. E.g. black pods ➢ Increase in social vices (crimes including theft, deviate behavior, etc) ➢ Litigation and bad moral practices, i.e. lack of respect ➢ Increase in population thus increasing demand and all things being equal price rises due to pressure on facilities ➢ Improper waste disposal ➢ A greater portion of land will be used for agricultural purposes	➢ Some of the trees will uproot and branches will break and destroy crops (there will be high wind through effect). ➢ The presence of trees will attract loggers who will cut the trees and destroy our crops. ➢ Over shading by the trees will reduce crop yield ➢ Increase in crop pest and diseases as some trees tend to serve as habitat for crop pest and diseases	➢ Reduce production of both food crops and cash crops: thus will result in high prices of food crops ➢ In the long run, we can't use the land for any other purpose other than planting of trees. ➢ Over shading by the trees will reduce crop yield ➢ Trees will uproot and branches will break and destroy crops ➢ The charcoal burners will cut the trees and destroy our crops.

4.5.5 Strategies to minimize potential negative effects of REDD+ implementation and enhance livelihood

Important strategies to overcome potential negative effects of REDD + implementation are woodlot establishment for charcoal and fuel wood production, planting of shade tolerant crop varieties and non-shady trees on farmlands (Table 15)

Table 16: Indicate ways potential negative effects of REDD+ Implementation could be minimized to improve your capital base and enhance your livelihood (based on results from the focus group discussions in the study communities in three districts in Ghana).

Aowin-Suaman district	Asikuma-Odoben-Brakwa district	Kintampo north municipal district
➢ The trees that would be planted should not be in a way that will negatively affect crop production. ➢ The trees should also not be shady ➢ Rules and regulations governing the community should be heightened ➢ Policies should be formulated and implemented on the basis of distribution of REDD+ benefits (money) to households. ➢ Educate community before and after implementation ➢ Money delivered to households should be in both cash and kind	➢ Timber contractors, government, landowners and farmers have to come to agreement before trees are cut from cocoa farms to avoid conflict. ➢ Timber laws governing forest have to be strengthened and enforced. ➢ Trees on cocoa farms will be reduced to the minimum recommended number as has been advised by agriculture extension agents. ➢ Only tree species which do not break or uproot easily will be nurtured or planted on farms. ➢ We will not tolerate timber on our cocoa farms to avoid destruction by loggers. ➢ Planting of shade tolerant crop species. ➢ Planting or nurturing of wind resistant trees on farmlands to avoid uprooting trees and breaking of branches to destroy crops. ➢ Involvement of land owners and farmers on allocation of trees on their farm to timber contractor. ➢ Nurturing or planting the recommended number of trees on farm land. ➢ Removal of pest harbouring trees from the farm.	➢ Demarcate specific portion of land for the REDD+ activities ➢ Locate land for a group of people to grow the trees ➢ We will minimize number of trees on our farms to have optimum yield for our crops. ➢ Wood lot will be established for charcoal and fuel wood production.

4.5.6 Coping strategies with potential negative effect of REDD+ implementation on livelihood

Coping strategies for farmers in Asikuma-Odoben-Brakwa and Aowin Suaman Districts
Although timber regulations are being changed, trees as natural resources which are not registered as privately planted by law belong to the government. As such timber contractors and government do not seek landowners and farmers consent before logging, forgetting that the farmer too has his or her crop which will definitely be affected either by the falling tree and the extraction machinery. So there is the need for the government to involve both farmers and land owners in decision making concerning allocation of timber species on cocoa farms to timber concessionaires for them to compensate them accordingly to avoid confrontation and conflict between the two parties.

The cocoa variety grown now does not strive well under heavy shade, and by leaving more trees during the project, the over shading will promote fungus growth which will definitely reduce the yield of the cocoa. Therefore, if new variety cocoa which is shade tolerant can be introduced it will help farmers to leave more trees and get optimum yield at the same time. Alternatively, tree species which does not provide more shade can be introduced, so that they can be readily planted on farms.

Most times land owners sell the trees to loggers without consulting the farmers thinking that the trees belong to them. The loggers cut the trees and destroy some crops in the process. This compels the farmers to kill the trees on farms. To avert this, landowners, farmers and loggers have to be contacted before the logging permit is issued to a concessionaire to avoid conflict and destruction of trees on farm land. Sometimes both the farmer and the landowner know nothing about the allocation of their farm to concessionaire which results in conflict from confrontations of loggers and the reduction of trees on farmlands.

Other coping strategies is to use earnings from participation in REDD + activities to enter other livelihood activities instead of the farming. The youth instead of relying on the farming can go into animal rearing and other alternative livelihood activities like aquaculture.

Coping strategies for farmers in Kintampo North District
Most of the crops grown in this district are light demanders (yam, groundnuts, rice, maize, cassava and cowpea) so leaving or planting more trees on that same piece of land will reduce the crop yield. There is the need for farmers to leave just few trees on the field or if more trees have to be left on these farmlands, farmers have to be adequately compensated for yield lost.

Farmers should be encouraged to establish wood lots for the charcoal and wood fuel production to avoid cutting down of the few indigenous tree species on their farms (off-reserve). This will create wealth and employment to the youth who engage in the charcoal production.

5.0 Conclusion and policy implication

This report sheds light on the potential effects of a REDD+ implementation on rural livelihood, changes in farming practices and conflicts in natural resource use in six communities in three study districts- Aowin-Suaman, Asikuma-Odobeng-Brakwa and Kintampo North Municipal.

The key findings from these analyses are that under social asset category, enhanced social relationship is expected by farmers in all the study communities, while under the financial asset category, increased savings are expected that are likely to result from an increase in financial institutions to accommodate both direct and indirect funds to be created through REDD+. Although not mentioned, climate change mitigation effect from increase in trees on farmlands from REDD+ activities is expected

On the potential negative effect, the perception of farmers is that reduction in food and cash production is expected from adoption of low carbon emitting farming practices. Although this may not be the reality, as results of Rainforest Alliance experiments with shade-tolerant cocoa varieties show the opposite. Also expected is increase in crop pests and diseases on farmlands from increase in tree cover on these lands.

Potential conflicts in relation to natural resource use are use of agricultural lands for crops production, instead of planting trees for more carbon, presence of trees on farmlands that are likely to attract loggers leading to destruction of food crops, and confrontation with loggers and reduction of trees on farmlands.

Important strategies to overcome potential negative effects of REDD + implementation are woodlot establishment for charcoal and fuel wood production, planting of shade tolerant crop varieties and non-shady trees on farmlands. Thus, a combination of land-sharing (agriculture with biodiversity elements) and land-sparing (agriculture spatially separated from biodiversity/conservation landscape elements) is proposed. The legal, property rights and institutional implication of such arrangements will have to be thoroughly assessed in the design of the REDD+ strategies.

Important coping strategies in the high forest study zone are a new variety of cocoa which is shade tolerant to be introduced to help farmers to leave more trees on farmlands and get optimum yield at the same time. In the drier forest study zone, because most crops grown are light demanders, enough compensation may have to be provided to farmers to enable them leave many more trees on farmlands to absorb carbon.

A further study may have to be done to provide an accurate comparison of net revenue earnings from cash (cocoa) and food (yam and rice) crop farming to that of a REDD+ intervention to help policy makers make informed decision. Also important is a comparison with the importance of the mining and logging sectors and the contribution of these sectors to the national economy.

In the short run, more may be required from the REDD+ funds to provide the necessary incentives to enable farmers change their farming practices in a way that will reduce deforestation and increase carbon stocks on farmlands.

References

Angelsen, A., Brockhaus, M., Kanninen, M., Sills, E., Sunderlin, W.D., Wertz-Kanounnikoff, S., (eds) 2009. Realizing REDD+: National strategy and policy options. CIFOR, Bogor, Indonesia.

Asare, R. A., Kwakye, Y., Foli, E. 2013. Ghana's REDD+ Registry pathways to development. Forestry Commission of Ghana, Accra

Agrawal, A., Nepstad, D., Chhatre, A., 2011. Reducing Emissions from Deforestation and ForestDegradation. Annual Review of Environment and Resources 36, 373-396.

Bell, A.R., Riolo, R.L., Doremus, J.M., Brown, D.G., Lyon, T.P., Vandermeer, J., Agrawal, A., 2012. Fragmenting forests: the double edge of effective forest monitoring. Environmental Science & Policy 16, 20-30.

DFID, FAO. 2000. Inter-Agency Experience and Lessons: from the Forum on Operationalizing Sustainable Livelihood Approaches. (www.fao.org/docrep/x7749e/x7749e00.htm)

FAO. 2011. Forests for improved nutrition and food security.

IEED 2011.Poverty and sustainable development impacts of REDD architecture.Available at http://www.iied.org/natural-resources/key-issues/forestry/poverty-and-sustainable-development-impacts-redd-architecture.Accessed on 10. 4. 2012.

Mann C., Tinsey J., Tedjo G., Nwadei T., 2010. Ghana's rural finance system and climate regime. An indepth analysis. A report prepared for WWF

McMillan, R.P., McMillan, J., 1987. Auctions and bidding. Journal of Economic Literature 25:699-738.

Latacz-Lohmann, U., Van der Hamsvoort, C., 1997.Auctioning conservation contracts: A theoretical analysis and an application Am. J. Agr.Econ. 79 (2): 407-418.

Yasmi, Y., Kelley, L., Murdiyarso, D., Patel, T. The struggle over Asia's forests: An overview of forest conflict and potential implications for REDD+. International Forestry Review. 14, 1-11

Glasl, F. 1999. Confronting conflict: A first-aid kit for handling conflict; Hawthorne: Gloucestershire, UK

Yasmi, Y., Colfer, C.J.P. 2010. Forestry and fishery conflict in DanauSentarum: Application of an impairment approach. Borneo Research Bullet. 41, 145-161

Patel, T., Dhiaulhaq, A., Gritten, D., Yasmi, Y., De Bruyn, T., Paudel, S.N., Luintel, H., Khatri, D. B., Silori, C., Suzuki, R. 2013. Predicting future conflict under REDD + implementation. Forests. 4: 343-363

DFID, FAO. 2000. Inter-Agency Experience and Lessons: from the Forum on Operationalizing Sustainable Livelihood Approaches. (www.fao.org/docrep/x7749e/x7749e00.htm)

Bamfo, R. 2010. Readiness preparation proposal (R-PP). Submitted to Forest Carbon Partnership Facility (FCPF), 10 January 2010, Accra, Ghana,

Bamfo, R. 2008. Readiness Plan Idea Note (R-PIN), Ghana, Accra, 6 May 2008

Jagger P., Sills E.O., Lawlor, K. and Sunderlin, W.D. 2010. A guide to learning about livelihood impacts of REDD+ projects. Occasional paper 56. CIFOR, Bogor, Indonesia

Mbow, C., Skole, D., Dieng, M. Justice,C., Kwesha, D., Mane, L., El Gamri, M., Vincent Von Vordzogbe, V., Virji,H., 2012. Challenges and Prospects for REDD+ in Africa: Desk Review Of REDD+ Implementation in Africa. GLP Report No. 5. GLP-IPO, Copenhagen

Hansen, M.C., P. V. Potapov, R. Moore, M. Hancher, S.A. Turubanova, A. Tyukavina, D. Thau, S.V. Stehman, S.J. Goetz, T.R. Loveland, A. Komardeey, A. Egorov, L. Chini, C.O. Justice, and J.R.G. Townshend. 2013. High-Resolution Global Maps of 21st-Century Forest Cover Change. Science 342(6160):850-853. doi: 10.1126/science.1244693

ANNEXES

Annex 1: Livelihood framework

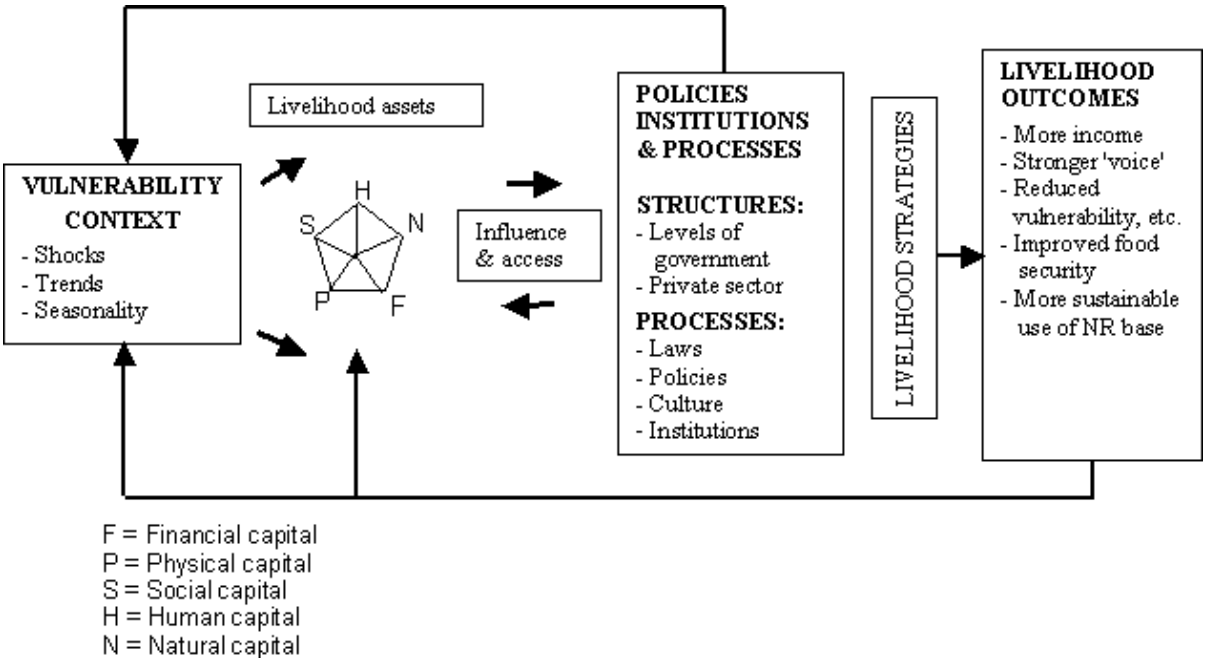

Figure 1: Sustainable livelihood framework (DFID, FAO 2000)

Annex 2:

Auctioning farmland's environmental services in forest and savanna transition zone under a REDD+ regime in Ghana: A preliminary analysis

Designing agri-environmental goods and services for auction

1. Improving the quality of environmental services (minimum) on cash crop (shea nut tree retention, cashew, etc) farmlands (One hectare)
2. Improving the quality of environmental services on perennial food crop farmlands (One hectare)
3. Improving the quality of environmental services on fallow lands (one hectare)

Describe the management prescription

1. Cash crop farmlands: Minimum quality (include retention of 10 indigenous trees of economic importance (dawadawa, shea nut, teak, cashew) of 4 different species
2. Perennial food crop farmlands (include plant/retain 10 indigenous trees of economic importance of 4 different types)
3. Fallow farmland (include plant/retain 20 indigenous trees of economic importance of 4 different species)

Instruction for the auction

General

This is an experiment in the economics of decision making. The instructions are simple and if you follow them carefully and make good decisions you will earn money that will be paid to you privately in cash

Summary

- Sellers/farmers have three types of items, which can have different costs and quality levels valued differently by the experimenter (who is the buyer).
- Costs and quality levels may change from period to period and vary across sellers.
- Sellers/farmers submit offer prices for three types of items, but the experimenter will buy no more than one item from each seller.
- The experimenter purchases the lowest price items per unit of quality, and spends a constant budget in every auction.
- If you sell an item the price you receive is determined by the lowest price per unit of quality offered by a seller who has all of his or her offers rejected in the auction.

Are there any questions now before we begin the experiment?

Write your name…….. Community……

Round 1: Make an offer (How much will you be willing to accept for payment in order plant and maintain trees on):

1. Blue (cash crop farmland-one hectare) GHC
2. RED (Perennial crop farmland-one hectare) GHC

3. Yellow (Fallow land-one hectare) GHC

Write your name…….. Community……

Round 2: Make an offer

1. Blue (cash crop farmland-one hectare) GHC
2. RED (Perennial crop farmland-one hectare) GHC
3. Yellow (Fallow land-hectare) GHC

Write your name…….. Community……

Round 3: Make an offer

1. Blue (cash crop farmland-hectare acre) GHC
2. RED (Perennial crop farmland-hectare acre) GHC
3. Yellow (Fallow land-hectare acre) GHC

Annex 3: **FOCUS GROUP QUESTIONNAIRE**

Potential effects of REDD+ Implementation on livelihoods

Introduction

Livelihood is defined as comprising of the capabilities, assets (both material and social) and activities required for a means of living (DFID 1999). Assets are vehicles/means for making a living, making living meaningful, and they provide the capabilities to challenge and change the world.

a. Number of participants in group1, 2, 3 (6-8)……..

   (Make 2 to 3 groups per site)

b. GPS coordinates……..

c. Community of residence…….

d. Administrative district……..

e. Gender: Male (number)……, Female (number)……..

f. Time for one group discussion: Begin time……; End time……..

1. What are your main livelihood activities? Please rank them in relation to each other (write the mean rank of the group)

Activity	Importance			
	Rank (average)	Duration engaged in it (days/wk) (gp mean)	Income it generated(per season in a year) (gp mean)	Number of years engaged (gp mean)
Farming • Agriculture (crops +trees), animal husbandry				
Fishing, hunting				
Trading				
Clerical (secretary..)				
Traditional artisanship (specify) • Craft maker, dress making,				
Non-traditional artisanship(specify)				
Professional (teacher, nurse) • Public and civil servants				
Managerial (specify)				
Others (specify)				
	1.Most important 2. Important 3. least Important			

2. Indicate the type of capital assets you obtain/derive from engaging in this activity

Type of capital assets	Explanation	Units/quantities /tally	Remark/totals
a. Social	The ways in which peoples social relationship, networks, associational and institutional linkages represent livelihood resources		
b. natural	Distribution of owned natural assets e.g. private land, private housing plots, livestock and privately owned trees		
c. Human	Relate to availability of services such as education and health to the individual		
d. physical	Visible assets owned by individuals within the household (car, house, tables, etc)		
e. Financial	Financial services required and used by individual (e.g. credit, savings, insurance, social security, regular flow of money to individuals e.g. remittances)		

Discuss

a. Levels of assets and their distribution among individuals/groups
(Gender and age separation are essential throughout the discussion)

Changes in asset status over time

b. cycles within a year and
c. longer-term changes

Discuss the roles assets play in livelihoods (some assets – e.g. livestock – fulfil multiple functions)

3. Indicate the potential effect of REDD+ implementation on your capital acquisition

Type of capital assets	Indicators of impact	Nature of impact
a. Social	• Extent of reliance on network • % of household income from remittances • % of household expenditure for gifts	

	and transfers • old age dependency ratio	
b. Natural	• Security of tenure for household plots • Level of availability of small patches of land for livestock • Availability of rivers and nature of follows, rainfall changes, pollution level, soil fertility levels, forest composition etc • Nature of waste disposal	
c. Human	• Live expectancy at birth (how long people live before they die) • Adult mortality rate (age 15 years and dying before age 60 • Under five mortality rate • Primary school net enrolement rate and completion rate • Literacy rate • Newspaper readership	
d. physical	• Possession of items that enhance income (bicycle, sewing machine, agric implements) • House quality and facilities (wall, floor, roof construction material, cooking utensils, furniture • Have access to pipe water, electricity and waste disposal • Possession of personal consumption items (radios, refrigerator, television)	
e. Financial	• Have financial credit sources, mention them • What are the condition and cost of borrowing • Level of personal savings • Level regular flows of money to individuals/household (remittance income, pension)	

3. Indicate the potential positive effects of REDD+ implementation on your capital acquisition

4. Indicate the potential negative effect of REDD+ Implementation on your capital acquisition

5. Indicate ways the potential negative effects of REDD+ implementation could be minimized to improve your capital base and enhance your livelihood

a. List from the most feasible to the least feasible

b. The most feasible to be discussed in further details

6. What are the coping strategies available to you following the negative impacts of REDD+ implementation on your livelihood?

a. Discover and identify alternative and increasing livelihood options to improve the prospects of local communities

b. Do group discussion to describe evolving patterns of activity in a community and provide interpretations of the reasons for changes that have taken place

c. Take note of patterns or strategies that could be adopted by those who would manage to survive the potential negative REDD+ implementation situation

The END!!!!!!
Provide plains sheets for writing the additional Answers
Provide tape recording for recording important discussion from individual participants