REDD+ in agricultural landscapes: evidence from Ghana's REDD+ process

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Support: ITTO REDDES Programme and SECO

Cover picture: View from Aponoponso Village, Ashanti Region, Ghana.

Printed in Ghana

ISBN: 978-9988-2-0238-5

First Edition

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Printed and bound by Fontstyle

Acknowledgements

This publication was prepared in the framework of the Thematic Programme on Reducing Deforestation and Forest Degradation and Enhancing Environmental Services in Tropical Forests (REDDES) supported by the International Tropical Timber Organization (ITTO). REDDES aims to improve livelihoods through the sustainable management of forests in tropical countries. The case studies presented in this publication derive from 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 Swiss State Secretariat for Economic Affairs (SECO) kindly supported the publication of this report. According to SECO's Ghana Country Strategy (2013–2016), through such support SECO aims to assist the country to "develop sustainable, integrated value chains, mainly in agricultural and forestry products" in the context of its REDD+ programme.

This publication would not have been possible without the collaboration of many people within the Forestry Research Institute of Ghana, the Ghana National REDD+ Secretariat, the Kwame Nkrumah University of Science and Technology, and the Bern University of Applied Sciences/School of Agricultural, Forestry and Food Sciences.

Contents

Acronyms and Abbreviations

BAU	Business As Usual
CREMA	Community Resource Management Area
CSE	Carbon Stock Enhancement
dbh	Diameter at Breast Height
GDP	Gross Domestic Product
GH¢	Ghanaian Cedi
ha	Hectare(s)
HFZ	High Forest Zone
ITTO	International Tropical Timber Organization
kg	Kilogram(s)
MRV	Monitoring, Reporting and Verification
NAMA	Nationally Appropriate Mitigation Action
NTFP	Non-Timber Forest Product
REDD+	Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks
REDDES	ITTO Thematic Programme on Reducing Deforestation and Forest Degradation and Enhancing Environmental Services in Tropical Forests
SECO	Swiss State Secretariat for Economic Affairs
SFM	Sustainable Forest Management
tC	Tonne(s) of Carbon
US$	United States Dollar(s)

1 Introduction

According to the Intergovernmental Panel on Climate Change (2013), global vegetation stores about the same amount of carbon dioxide as contained in the atmosphere, and tropical forests hold about half of that amount (Pan et al. 2011). Despite partially successful measures in some countries to reduce deforestation and forest degradation, tropical forest loss continued at an estimated 92 000 km^2 per year between 2000 and 2012 (Hansen et al. 2013), equivalent to about 24 football fields per minute. The resultant net loss of biomass is responsible for about 10% of global annual carbon dioxide emissions (Intergovernmental Panel on Climate Change 2013); tropical forest loss, therefore, is an important driver of climate change. The international community is aware of the climate-regulating role of forests and trees and has created a mechanism aimed at reducing tropical deforestation and forest degradation and enhancing the conservation and sustainable management of forests and forest carbon stocks, a mechanism usually known as REDD+. Under REDD+, tropical countries will be financially compensated for accomplished objectives in reducing deforestation and forest degradation, sustainably managing forests, conserving forest carbon stocks and enhancing forest carbon stocks. Around 65 countries have engaged in REDD+ preparations and are at different stages between policy development and national programme development under various multilateral frameworks (FCPF 2014). While the world is still "on the road to REDD+" (UN-REDD 2013), substantial progress was made in global climate talks in Warsaw in 2013 in developing the REDD+ concept as a global-scale measure to mitigate climate change. Moreover, REDD projects represent the majority of carbon-offset deals concluded in voluntary carbon markets in 2013 (Forest Trends 2014).

However, while the protection of forests is regarded as one of the most promising measures for combating climate change, the expected carbon-offset payments are only a part of the advantages that forest and tree conservation can bring in developing countries. Forests and trees can enhance biodiversity, protect watersheds, and improve local livelihoods and forest governance—functions often called co-benefits under REDD+.

The multiple advantages that increased tree density can provide is clearly recognized in Ghana's national strategy for REDD+, which goes beyond forest boundaries to include trees and woodlots outside forests in agricultural

landscapes. From a REDD+ perspective, this zone is called "off-reserve" (officially classified forests in Ghana are called "forest reserves"). This approach of seeking REDD+ opportunities outside official forest boundaries makes sense in a country where agricultural zones traditionally include a relatively high density of tree cover and where agricultural and forest zones are understood as parts of a continuum. The opportunity to increase tree density in agricultural and agroforestry systems means that the forest and agricultural sectors need to collaborate and work together at a landscape scale. It also means that increasing tree stocks on farms must be endorsed by the women and men of farming communities and by both the agricultural and forest services.

Therefore, the preparation of further off-reserve REDD+ activities in Ghana needs to provide realistic solutions for people who rely heavily on the land for their livelihoods. The case studies compiled in this report aim to contribute to the development of approaches that generate short-term revenues in combination with longer-term gains from tree resources. The report describes the outcomes of empirical and literature studies exploring the potential of off-reserve REDD+ in Ghana. The studies underlying the report were carried out in the framework of REDDES, a programme of the International Tropical Timber Organization (ITTO) that aims to strengthen capacities in selected countries to maintain and enhance the environmental services provided by tropical forests.

Section 2 of this publication introduces the concept of REDD+, explores the opportunities for REDD+ in off-reserve areas in Ghana, and discusses the concept of benefit-sharing. Section 3 describes the core results of the studies carried out under the project, all of which took place in, or reference, the potential pilot areas defined in the REDD+ readiness preparation proposal Ghana is preparing in the framework of the Forest Carbon Partnership Facility. Two studies assess farmers' views on the potential effects of REDD+ in their areas and the incentives that would motivate them to include (more) trees in their systems—thus allowing the development of concrete proposals for REDD+ implementation in Ghana. Other studies compare the performance of different land-use systems in increasing carbon stocks and farmer income; analyze the costs and benefits of potential pilot projects focusing on shea trees and essential-oil production; and assess the extent to which experiences in cocoa certification standards could be applied to the introduction of REDD+ projects in cocoa-growing areas.

Section 4 of this publication sheds light on the ongoing and dynamic process of REDD+ implementation in Ghana, including the development of a legal framework for managing carbon rights in the country. Concluding

remarks outline the way forward, from a policy perspective, for REDD+ pilot implementation in Ghana for the benefit of people and the land. While REDD+ implementation represents challenges, it is also a chance to obtain assistance in securing, for the current and future generations, the ecosystem services provided by forests and trees, including climate-change mitigation.

2 Setting the Stage for REDD+ in Ghana

2.1 DEFINITION AND IMPLEMENTATION CRITERIA

REDD+ is an international initiative aimed at reducing deforestation and forest degradation through the establishment of performance-based incentives. It aims to create financial and other types of incentives to reduce the rate at which forests are being converted to other land uses and in the process causing greenhouse gas emissions. REDD+ is a form of payment for ecosystem services and represents a vast shift from the way in which forested African countries and donors have traditionally thought about and engaged in forestry and agroforestry projects. The power of REDD+ projects is that they involve the active monitoring of forests, and payments are not disbursed until an impact is demonstrated.

The term REDD was coined as an acronym for "reducing emissions from deforestation and (forest) degradation", but the concept has since evolved to encompass carbon stock enhancement (CSE), sustainable forest management (SFM) and forest conservation; taken together, this evolved concept is captured in the term REDD+. The box provides specific definitions of the main elements of REDD+.

Definitions of deforestation, degradation and the "plus" in REDD+

Deforestation: The direct human-induced conversion of forested land to non-forested land, such as for agricultural, pastoral, water storage or urban uses. Deforestation effectively means a reduction in crown cover from above a defined threshold to below this threshold. For the purposes of REDD+ in Ghana, forest is defined as constituting 15% canopy cover, with trees able to attain a height of 5 meters and covering a minimum area of 1 hectare.

Degradation: The direct, human-induced long-term loss of forest carbon stocks caused by a decrease in forest canopy cover that does not qualify as deforestation.

Plus (+): Carbon stock enhancement (CSE) within a forest, the conservation of carbon stocks, and sustainably managing forests. CSE is only eligible within a forest or on land that was recently deforested and involves the sequestration of carbon through forest growth or tree-planting within a forest landscape. There is significantly less clarity about what the conservation of carbon stocks means in practice, and the ability to implement this type of REDD+ activity will depend on the development of an internationally accepted methodology. "Sustainably managing forests" allows for the harvesting of timber (e.g. silvicultural management) as part of a strategy to reduce the drivers of deforestation or degradation associated with illegal or unplanned activities.

In general terms, the quantum of emission reductions or enhancements arising from the implementation of a REDD+ project would be quantified based on a globally recognized methodology. That positive quantity would then be valued as credits that eventually could be sold in an international carbon market. Alternatively, the credit could be transferred to an international fund set up to provide financial compensation to participating countries that conserve their forests. Also, such credits can be used in greenhouse gas inventories for emission reduction obligations.

Designing a REDD+ project is a demanding endeavour that takes time and technical capacity and usually requires significant upfront financial resources. The following are critical criteria or elements in designing a feasible REDD+ project.

1. **BAU.** There must be a clear understanding of the **business as usual (BAU) scenario** in terms of land-use practices and land conversion, and the main direct and indirect drivers of deforestation/degradation need to be identified and future threats to the forest recognized. The foundation of REDD+ is that if the BAU scenario continues and nothing is done to address the associated threats, then the forests and trees in the landscape will continue to be degraded or deforested at their present rate.
2. **Baseline and reference level.** A **baseline** quantifies the deforestation or forest degradation that has occurred in the past. If there has been no forest loss, REDD+ cannot work. The most common method is to use the deforestation rate for the past ten years as a baseline and to project this rate forward over time as an indication of what will

happen in the future if nothing changes. The **reference level** is an estimate of the amount of emission reductions the proponents think a project can avoid in comparison with the baseline. In the case of CSE, proponents must estimate the amount of sequestration the project could facilitate.

3. **Activities.** A REDD+ project represents a focused intervention to alter the BAU scenario by changing management or land-use practices, thereby reducing the rate of deforestation/degradation (reducing emissions) or enhancing carbon sequestration. Therefore, a project must identify a realistic set of activities that can reduce emissions from the ongoing deforestation or degradation or foster substantial sequestration.

4. **Tenure and governance.** Clear land tenure, tree tenure and user rights are essential for effective REDD+, and approval from the landowner is also a prerequisite. With respect to future carbon transactions, only the landowner has the legal authority to approve the project and the sale of credits. A sustainable project governance and management structure is crucial for managing tenure issues and ensuring equitable implementation and benefit-sharing.

5. **Ghana's forest definition.** The project area must fall within or contain "forested" land that fits the minimum REDD+ forest definition of a canopy cover of 15%, a tree height of 5 meters, and an area of 1 hectare.

6. **Additionality.** REDD+ projects must demonstrate that the emission reductions and other benefits would not have been realized without the REDD+ project.

7. **Permanence and risk assessment.** A REDD+ project must be designed to ensure that emission reductions will persist over the life of the project (20–30 years) and that the associated carbon assets are permanent. Projects are required to conduct a risk assessment that describes the various risks and specify plans to mitigate those risks.

8. **Reduce leakage.** Projects are monitored for leakage—that is, where a reduction in emissions in the project area leads to emissions outside the project boundaries—and must have strategies to reduce leakage potential.

9. **Benefit-sharing arrangement.** Each project must have a benefit-sharing structure that is legal and which stakeholders feel is fair and transparent. Failure to design a system that is equitable and transparent increases the likelihood of project failure.

10. **Monitoring, reporting and verification (MRV) plan.** MRV is the foundation of any robust, genuine REDD+ project; all REDD+ projects, therefore, are required to have an MRV plan. Once a project has started, and continuing periodically (usually every 3–5 years) over the life of the project, the project proponent must demonstrate (i.e. measure and report) the degree to which it has been able to produce emission reductions. Such reports must be verified by an independent, third-party auditor.

11. **Free, prior and informed consent.** The United Nations Declaration on the Rights of Indigenous Peoples states that indigenous peoples have the right to self-determination and shall not be relocated (or subjected to other types of activities or transactions) without their free, prior and informed consent. This principle is recognized for local communities in REDD+ projects. For any REDD+ project, therefore, all people residing within a project area must have knowledge of the proposed project and must give their consent openly and freely. All projects must also conduct a social and environmental safeguards assessment.

2.2 OFF-RESERVE LAND USE AND IMPLICATIONS FOR REDD+ IN VARIOUS ECOLOGICAL ZONES OF GHANA

Cocoa farm

Five emission reductions and removal enhancement activities may be implemented under a REDD+ strategy in off-reserve areas in Ghana. These are:

1) avoided deforestation (planned and unplanned)—e.g. halting the rate of primary and secondary forest conversion;

2) avoided degradation (planned and unplanned)—e.g. avoiding authorized logging in natural forests (primary and secondary), in particular in sacred groves and relict forests;

3) sustainably managing production forests;

4) forest CSE—e.g. agroforestry interventions, especially the use of shade trees and the management of natural regeneration leading to the development of secondary forests, woodlots and afforestation; and

5) conservation of forest carbon stocks—e.g. the conservation management of sacred groves and other dedicated forests and gallery forests.

There are also options for combining strategies to create a particular methodology at a landscape (or jurisdictional) level, such as for carbon accounting in project activities that reduce emissions from mosaic deforestation and degradation. Nevertheless, Ghana's off-reserve areas are characterized by diverse land uses and drivers of land-use change, including conflicts over land-use rights, land and tree tenure and stakeholder interests. Therefore, the potential for REDD+ projects in off-reserve areas require careful analysis of a wide range of factors to ensure project feasibility. To achieve major impacts, REDD+ projects in Ghana's off-reserve areas should always be considered at a landscape scale.

REDD+ potential in different ecological zones in Ghana

The savanna and transitional zones of Ghana consist of vast areas of woodlands and grasslands, with few forest patches as per Ghana's forest definition. Land tenure is generally clear, with few or no disputes over land; ownership is mostly held by a single paramount chief. This is particularly true for most parts of Gonja and Dagomba lands and the Upper West Region, where most of the remaining savanna forests and woodlands are located.

Drivers of deforestation and degradation in savanna forests and woodlands can be described as largely mosaic rather than frontier; they include: the practice among hunters and Fulani herdsmen of setting fire to vegetation; the illegal logging of precious lumber, such as rosewood and mahogany; slash-and-burn agriculture; and unregulated charcoal production. The charcoal production chain is a particularly significant driver of land-use change in

savanna/transition landscapes. For example, it is estimated that 7 kg of wood is required to produce 1 kg of charcoal (Mombu et al. 2007). However, any attempt to regulate and streamline charcoal production should be examined carefully because it is a major component of rural livelihoods in savanna/transition landscapes.

Ghana has one of the highest rates of deforestation in Africa—up to 2% per year within the high forest zone (HFZ) (FAO 2006)—and the country has lost more than 85% of its forest cover in the last 100 years (Hansen et al. 1999). Cocoa production has been one of the prime deforestation drivers in this zone since the 1950s, and other factors include the conversion of forested lands to annual crop agriculture (slash-and-burn agriculture); illegal logging; and the uncontrolled harvesting of non-timber forest products (NTFPs) (Republic of Ghana 2010).

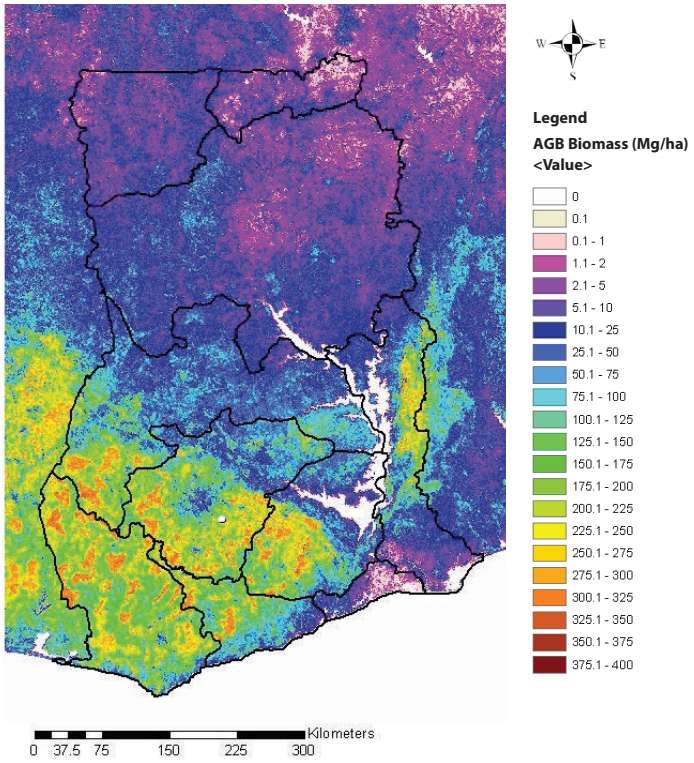
The increase in cocoa production in the past decade has been due largely to an expansion in the area of land under cocoa rather than to improved productivity. In Ghana, agroforestry, tree crops (such as cocoa and cashew) and agriculture are just as important as the forest sector in determining options for REDD+, because most deforestation is due to conversion for these purposes. The cocoa sector presents interesting opportunities for REDD+, with potentially major impacts given its dominant position in the HFZ. Aitken (2009) observed no significant effect of cocoa variety on carbon stocks or the number of shade trees on farms growing new and old varieties.[1] On their own, few cocoa farmers are likely to adopt shade-tolerant cocoa varieties (i.e. Amazon and Amelonado/"Tetteh Quarshie"), but an effective off-reserve REDD+ project could provide incentives[2] to induce such farmers to plant shade trees, irrespective of the cocoa variety they use (because the new varieties are known to tolerate appreciable levels of shade).

1 Amazon and Amelonado/"Tetteh Quarshie" are old varieties, and new varieties are hybrids.

2 Incentives could include the review and practical enforcement of tree tenure regimes; awareness-raising and sensitization to favourable laws and policies that encourage trees in farming systems; and adequate compensation for farm damage and conflict management associated with off-reserve timber exploitation.

Biomass Map of Ghana 2008/2009

(administrative boundaries), Katoomba Group et al. 2011



Savanna zone

Based on the biomass map of Ghana (Katoomba Group et al. 2011), the carbon stocks of forests in the savanna zone have been judged to be "medium", with high drivers of exploitation and conversion due to illegal logging, agriculture and charcoal production. There is also high potential for additionality and co-benefits for wildlife habitat, the provision of NTFPs, etc., but a major constraining factor for REDD+ projects (i.e. avoided deforestation or degradation and the conservation of forest carbon stocks) is that the areas could be too small to be viable. Most forest patches in the savanna zone are located in forest reserves and protected areas, with few remaining off-reserve patches. There is a need to quantify the area of these forests before concrete decisions are taken.

Croplands have been judged to have low carbon stocks because they mostly comprise annual crops, which have low biomass (Adu-Bredu et al. 2010). Croplands have huge potential for forest CSE (assuming that CSE is applicable

on lands not classified as forests) because of the high additionality, limited constraining factors and the potential for the implementation of crosscutting measures such as good governance interventions. Grasslands and woodlands also have huge potential for CSE, but these cannot be classified as forest. Interventions are needed, however, to reduce the high threat of exploitation of grasslands and woodlands for charcoal, agriculture and unregulated logging, including strategies to boost forest recovery. Wetlands and other lands have limited potential for emission reductions.

Transitional zone

There are appreciable areas of forest in the transitional zone with "medium" carbon stocks. There is also enormous pressure on these forests from charcoal production, agriculture and unregulated logging, as well as from frequent wildfires. Such forest areas have high additionality because they are not under any form of regulation and there are also high potential co-benefits and a relatively high chance of successful crosscutting measures. Project interventions to halt deforestation and avoid degradation are possible, but a major constraint is a lack of clear land tenure. Most landholdings are fragmented, and efforts will be required to ensure the permanence of emission reductions and carbon stocks.

Forest CSE has greater potential in cropland areas in the transitional zone compared with grasslands/woodlands, which lack sufficient scale despite other favourable factors. Wetlands and other lands in the transitional zone lack the necessary scale for REDD+ interventions.

High forest zone

Forests in the HFZ have high carbon stocks, which are threatened mainly by the expansion of cocoa and other tree crops, as well as by agriculture and illegal logging (Republic of Ghana 2010). It is not clear, however, if there is sufficient remaining off-reserve forest for viable REDD+ projects, given that the off-reserve resource is highly fragmented and exists in small patches; lack of clear land tenure is also a major constraint. Most land is held under various traditional authorities and families. There are concerns about land disputes, which could hinder the permanence of emission reductions. There is a need to properly quantify the off-reserve forest resource to enable an assessment of the viability of avoided deforestation/forest degradation projects. Some forests in off-reserve areas may be sacred groves and relict forest, potentially providing options for forest carbon

stock conservation (assuming that the total area of these forests is sufficient for a viable REDD+ intervention and also that a methodological approach is available for forests in small patches). This potential arises because many communities are losing their traditional governance and law enforcement mechanisms, which previously restricted people from using these forests.

Land-tenure issues will limit the smooth implementation of forest CSE projects in the HFZ, even though scope exists for additionality, co-benefits and crosscutting measures such as good governance interventions. Grasslands have potential for forest CSE, but major constraints such as a lack of clarity on land tenure and a lack of scale could make such projects unviable. Wetlands, on the other hand, have favourable criteria for the implementation of REDD+ strategies: they have very high carbon stocks compared with terrestrial forests (Asante and Jengre 2012) and huge options for co-benefits due to the ecological roles played by mangroves in fish spawning, etc., and they face massive exploitation, mainly for woodfuel.

Conclusion

The potential for REDD+ implementation is mixed in off-reserve areas in the three ecological zones. Forestlands in the savanna zone have a number of favourable characteristics, but REDD+ interventions are highly unlikely because of a lack of scale. Grasslands and savanna woodlands have the potential for interventions at a larger scale, but they are constrained by the fact that they cannot be considered forests (based on Ghana's national definition of forests). Thus, the only viable REDD+ mechanism in the savanna zone that could qualify for the compliance and/or the voluntary market is forest CSE.

On the other hand, the transitional zone appears to have relatively high potential for REDD+ in off-reserve areas, but only if an integrated landscape approach is adopted. This is because the drivers of deforestation and forest degradation are mosaic in nature and not frontier, with charcoal production and unsustainable farming systems the dominant anthropogenic activities in the landscape. In the HFZ, the viability of REDD+ projects in off-reserve areas is uncertain because it is unclear if cocoa qualifies under the national definition of forest. If cocoa is considered to be an agricultural land use, then the only REDD+ intervention in off-reserve areas would be forest CSE. If cocoa is classified as forest (a position that would contradict the reality on the ground and the Ghana readiness preparation proposal), REDD+ interventions could be possible at a huge scale.

2.3 REDD+ BENEFIT-SHARING AND ITS OPPORTUNITIES IN GHANA

REDD+ aims to compensate governments, communities, companies and individuals in developing countries for achievements in reducing emissions from deforestation and forest degradation. The aim of REDD+ is to make forest protection more attractive than forest reduction (Global Witness 2010). As an idea, REDD+ could be considered a success story because it has generated excitement for its potential to quickly and cost-effectively mitigate climate change. The REDD+ concept has been subject to an intensive process of conceptualization, design and implementation, but it is yet to bring about large-scale emission reductions (Angelsen et al. 2012).

Benefit-sharing for REDD+ can be defined as agreements between stakeholders about the distribution of monetary benefits from the commercialization of forest carbon. It can also be referred to as the distribution of benefits—both monetary and non-monetary—generated through the implementation of REDD+ projects. The non-monetary benefits (i.e. benefits that are difficult to assess in financial terms) may include the empowerment of communities, enhanced natural assets, and increased skills and employment (Angelsen et al. 2012). From an economic standpoint, the main categories of revenues that could be shared in REDD+ schemes are the compensation of opportunity costs, funding for productive activities, and REDD+ rent (Peskett 2011).

There are two main reasons for sharing benefits. One is to create effective incentives for the implementation of REDD+ schemes by rewarding individuals, communities, organizations and businesses for actions that change land uses and reduce emissions. This provides benefits somewhat in excess of the cost of their sacrifices to change otherwise legal behaviour. The second reason is to build wider national (and international) legitimacy and support for the REDD+ mechanism. This can only be achieved if people who are directly affected by REDD+ actions and the wider public are treated fairly and equitably, which may mean sharing benefits more widely than a strict focus on incentives would dictate (IUCN 2009). Another reason for sharing benefits may be the empowerment of marginalized groups in society (e.g. the landless poor) who would otherwise miss out on such benefits.

While REDD+ benefit-sharing is important for creating positive incentives for reducing carbon emissions, stakeholders must perceive it to be fair; otherwise, it could threaten the legitimacy of, and support for, REDD+. For the REDD+ mechanism to be effective in altering land-use practices, changes in behaviour that reduce emissions should be rewarded, either individually or collectively. Note, however, that the incentive will be diluted if too many people benefit from it who have not contributed. This, in turn, is likely to result in fewer emission reductions and overall benefits to share. On the other hand, certain actors may feel marginalized and unfairly treated and may view the mechanism as illegitimate if only certain groups or geographic areas are rewarded (IUCN 2009).

For any benefit-sharing mechanism to work it must address what are generally and widely known as the 3Es: effectiveness, efficiency and equity. Effectiveness deals with ensuring that REDD+ benefits reach those actors who contribute to reduced or sequestered emissions and create the right incentives for them to continue doing so in the long term. Efficiency is about ensuring that the benefit-sharing mechanism maximizes the return on each unit of investment by minimizing transaction and implementation costs and delivering benefits in a reasonable timeframe. Equity means ensuring that the benefits are distributed among all legitimate actors who have contributed to results in a manner that is widely perceived to be fair (USAID 2012).

According to Lindhjem et al. (2010), any REDD+ benefit-sharing mechanism is likely to have two main funding channels: a national REDD+ fund, and a project-based fund that goes directly to projects. The inclusion of both types of funding channels is known as a nested approach, in which a national REDD+ fund may be set up within or separately from the national administration or as an integrated part of state budgets. Benefit-sharing mechanisms can be organized along two main axes: a vertical axis of benefit-sharing across scales, from national to local; and a horizontal axis of sharing within scales, including within and across communities, households and other local stakeholders, and at the subnational and national levels (Angelsen et al. 2012).

Although there are several benefit-sharing arrangements in the agricultural and forest sectors in Ghana, benefit-sharing under a REDD+ regime is a new concept that is yet to be tested. The existing benefit-sharing schemes have limitations, and the extent to which they can be adapted to REDD+ projects is unknown. Foli and Dumenu (2011) proposed three benefit-sharing options for the implementation of REDD+ in Ghana: a community-managed revolving

credit scheme; an individual payments scheme; and a hybrid/combination of these two options. Dumenu et al. (2014, unpublished) also identified three options for the distribution of REDD+ benefits in Ghana: a national approach; a subnational/project approach; and a nested/hybrid approach. The proportions of benefits that should be assigned to each of the identified benefiting stakeholders (i.e. government, communities, farmers and traditional authorities) involved in REDD+ are yet to be determined and would require extensive consultation among all stakeholders. In the interim, it is unclear which benefit-sharing mechanism should be adopted for the REDD+ projects currently under way in Ghana.

3 Case Studies in Potential REDD+ Pilot Areas

3.1 FARMERS' EXPECTATIONS AND POTENTIAL LIVELIHOOD OUTCOMES FROM REDD+ IMPLEMENTATION

Farmers in their restored degraded forests

If REDD+ is to be effective in mitigating climate change, its potential positive and negative impacts need to be identified (Bell et al. 2012). This need is highlighted in Ghana's readiness preparedness proposal and readiness plan information note (Bamfo 2010).

Evaluating the impacts of REDD+ on local welfare, farming practices and natural resource use is critical for understanding the broader social implications and long-term political feasibility of REDD+. The aim of the case study summarized here, which involved six project communities, is to understand the potential implications of REDD+ implementation for livelihoods, farming practices and conflicts in natural resource use at the farm level in Ghana. The study also aimed to provide information on farmers' perceptions of REDD+ as a contribution to the design of Ghana's REDD+ strategy.

Theoretical background

The analysis in this work was based on four theoretical concepts: 1) the livelihood framework; 2) benefit-cost analysis; 3) auction theory and conservation contracts; and 4) the framework for identifying potential forest conflicts under REDD+ implementation. An auction is a market institution with a clear set of rules for determining resource allocation and prices on the basis of bids from participants in the market (McMillan and McMillan 1987). In the auction process, contracts are awarded using competitive bidding to obtain goods and services that do not have well-established markets (Latacz-Lohmann and Van der Hamsvoort 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.

Ghana is following a three-phase approach for the development and implementation of its REDD+ approach (Angelsen et al. 2009) and has reached stage two with financial support from the World Bank's Forest Carbon Partnership Facility. A number of activities are being undertaken with a view to developing viable strategies for moving into the third phase, one of which is the development of a REDD+ registry. Pilot projects have also been identified, although they are yet to be implemented. A detailed analysis of Ghana's REDD+ architecture, including policy, legal and technical requirements, has been conducted (Asare et al. 2013).

Study area, questionnaire design, sampling and data collection

The study was conducted in two communities in each of three administrative districts in different regions: the Adonikrom and New Yakasi communities

in the Aowin Suaman district, Western Region; the Bedum and Brakwa communities in the Asikuma-Odoben-Brakwa district, Central Region; and the Attakura and Tahirukura communities in the Kintampo North Municipal district, Brong Ahafo Region. Individual interview questionnaires were used to collect the data, and the sample units were farm household heads in the study areas. Random sampling was used to select the household heads for face-to-face individual interviews, which were conducted in May 2013; focus group discussions were also convened, for which a checklist of issues to be discussed was prepared from the literature. In the study communities, household heads were organized into groups for the focus group discussions and the group responses were recorded according to the checklist. For the collection of auction data, farmers in the study communities who were also landowners were identified and invited to participate in an auction exercise. Farmer groups were asked to indicate their bids (that is, the price at which they would be willing to plant and maintain 20 trees on 1 hectare of land).

Results and discussion

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

The least net revenue per farmer per ha per year derived from cash (cocoa) and food (rice and yam) crop farming is US$216 in the Asikuma-Odoben-Brakwa district; US$970 in the Aowin Suaman district; and US$782 in the Kintampo North Municipal district (a non-cocoa-growing area). Although these net revenues were observed at only one point in time and may not constitute a suitable basis for comparison with the expected earnings from a REDD+ intervention, it is still useful to make that comparison. This is particularly so for the net revenue per farmer per year in the cocoa-growing area in Aowin Suaman, which is exceptionally high (US$5822) compared with the average cocoa farmer's expected income of US$1500 (Mann et al. 2010). The net earnings from REDD+ interventions on cocoa farms in Aowin Suaman has been estimated at US$200 per hectare per farmer per year (Mann et al. 2010), which is approximately 5 times less than the net revenue from cocoa farming, according to the survey in Aowin Suaman. Thus, a larger REDD+ incentive may be required to encourage farmers to change their farming practices in a way that would reduce deforestation and increase carbon stocks on farmlands.

The requirement for greater payments from REDD+ interventions is reinforced by the auction results in the present study. The amount a farmer would require (mean bid per farmer) for a REDD+ intervention is US$6404 per acre (0.4 hectare) in the Tahirukura Kintampo community, US$4670 in Aowin Suaman and US$81 in Asikuma-Odoben Brakwa. In comparison with the value of a REDD+ intervention, these values are very high, with the exception of the amount required in Asikuma-Odoben-Brakwa district. The low bid values in Asikuma study communities may be due to farmers understanding that they were only quoting what they would take for incorporating trees on their farmlands. On the contrary, farmers in Aowin Suaman and Kintampo communities probably thought they were giving out their farmlands for the trees, hence the high bid values.

Potential effect of REDD+ implementation on livelihoods

Capital assets comprise human, social, financial, natural and physical capital (FAO 2000). Farmers acquire these assets through various livelihood activities and use them to improve their living standards according to their quantity and quality. Farm households in the study communities possess similar basic assets, and REDD+ implementation could have potential favourable and negative effects on each of the five asset types in all the study communities. In the social capital assets category, farmers in all the study communities expect to have enhanced social relationships, while in the financial asset category, increased savings are expected to arise as a result of an increased presence of financial institutions in the study communities to accommodate the direct and indirect transactions created by REDD+. Potential perceived negative effects are a reduction in the production of food and cash crops and an increase in crop pests. Conflicts may arise over the use of tree resources created under REDD+ implementation—farmers fear that such resources may attract legal and illegal loggers, which could cause the destruction of crops and confrontations with loggers; this issue is perceived to be particularly important in the Kintampo North Municipal district.

Conclusion

This study sheds light on the potential effects of REDD+ implementation on rural livelihoods, changes in farming practices and conflicts in natural resource use in six communities in three study districts—Aowin-Suaman, Asikuma-Odoben-Brakwa and Kintampo North Municipal. The study's key findings are

as follows: farmers in all the study communities expect REDD+ to enhance social relationships; increased savings are expected as a result of an increased presence of financial institutions; and farmers perceive that the adoption of low-carbon-emitting farming practices will lead to a reduction in food and cash production (although Rainforest Alliance experiments with shade-tolerant cocoa varieties indicate that the opposite may be true). Potential conflicts in relation to natural resource use include the use of agricultural lands for crop production (instead of planting trees for more carbon); and the potential for an increase of trees on farmlands to attract legal and illegal loggers, leading to the destruction of food crops and confrontations with loggers.

Strategies to reduce the negative effects of REDD+ implementation could include: the establishment of woodlots for charcoal and fuelwood production; and the 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 implications of such arrangements will need to be assessed thoroughly in the design of REDD+ strategies. An important coping strategy in the HFZ would be the introduction of a shade-tolerant variety of cocoa to enable farmers to retain or plant more trees on their lands and still obtain optimum cocoa yields. In the drier forest zones, where most crops are light-demanders, farmers will require sufficient compensation to enable them to retain trees on farmlands.

A further study may be needed to provide a more accurate comparison of net revenues from cash (cocoa) and food (yam and rice) crop farming and the revenue generated by REDD+ interventions to help policymakers in making informed decisions. Also important would be a comparison of the mining and logging sectors and their contributions to the national economy.

In the short term, REDD+ revenues may need to be higher than currently projected if they are to provide a sufficient incentive for farmers to change their farming practices in ways that will reduce deforestation and increase carbon stocks on farmlands.

3.2 LAND-USE SYSTEMS IN GHANA'S CENTRAL REGION AND THEIR POTENTIAL FOR REDD+

Young cocoa farm with food crops (left) and mature citrus plantation (right)

The objectives of this study are to analyze traditional land-use systems in the Asikuma-Odoben-Brakwa district with a focus on carbon stocks and economic benefits, and to assess the potential of introducing essential-oil crops as a REDD+ pilot. A private investor, Portal Ltd, has been cultivating essential-oil crops combined with enrichment planting in secondary forests and the establishment of a timber plantation. The BAU scenario in the area is the gradual conversion of all off-reserve land to agriculture. Most of the forest has already been cleared and is now under cash-crop cultivation.

Methods

Key informant interviews with stakeholders from the agricultural and forest sectors were conducted to determine the major land uses in the area. In five communities, a total of 32 farmers cultivating cocoa, oil palm, citrus or rubber were interviewed about cultivation practices and their experiences with essential-oil crops. On-farm data were collected in 53 plots, including those of Portal Ltd: tree species were identified and diameter at breast height (dbh) was measured for all trees with a dbh > 3 cm, including crop trees. The living above – and below-ground carbon stocks were estimated using an allometric equation on the basis of dbh and specific wood density. Income per crop was calculated with standard yields and market prices.

Results

Perennial cash crops such as cocoa, oil palm, citrus, rubber and teak, combined with food crops (maize, plantain, cassava) and various naturally regenerated trees, are common land-use systems in the district. Trees are used for fuelwood, local construction, food and medicines. The highest number of non-crop trees was found on cocoa farms (118 trees per ha, 22% of which had a dbh ≥ 30 cm). Figure 1 and Table 1 summarize the average volume of carbon stored by the various cash crops and the average income earned.

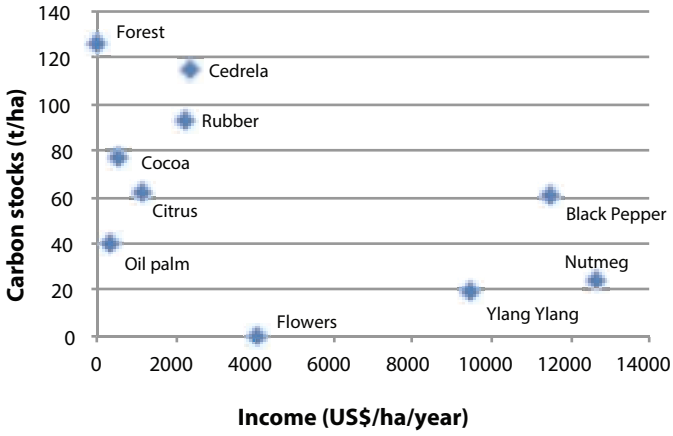


Figure 1: *Carbon stocks and economic performance of various land-use systems in Ghana's Central Region*

Table 1: *Average volume of carbon stored and income earned, by cash crop, for assessed farms in the Asikuma-Odoben-Brakwa district*

Cash crop	Carbon stored (tC/ha)	Estimated annual income (US$/ha/year)
Rubber (*Hevea brasiliensis*)	92.6	2 228
Cocoa (*Theobroma cacao*)	76.3	525
Citrus* (*Citrus sinensis*)	61.4	1 125
Oil palm (*Elaeis guineense*)	40.5	300
Portal Ltd land-use systems		
Enriched forest	126	0
Timber plantation (*Cedrela odorata*)	114.6	2 381#
Ylang-ylang (*Cananga odorata*)	18.9	9 462
Black pepper on *Gliricidia sepium* (Piper nigrum)	60.2	11 455
Nutmeg (*Myristica fragrans*)	23.9	12 630
Flowers	Negligible	4 070

* = if markets are accessible; # = after 25 years amounting to US$60 000/ha.

Figure 2 shows the carbon stocks stored over time in all systems grown by Portal Ltd; overall, the company stores an average of 81.3 tC per ha.

The perception of farmers towards the essential-oils project was found to be two-sided. On the one hand, 84% of interviewed farmers were interested in these high-value crops. On the other, the farmers distrusted Portal Ltd due to marketing failures in the company's early years.

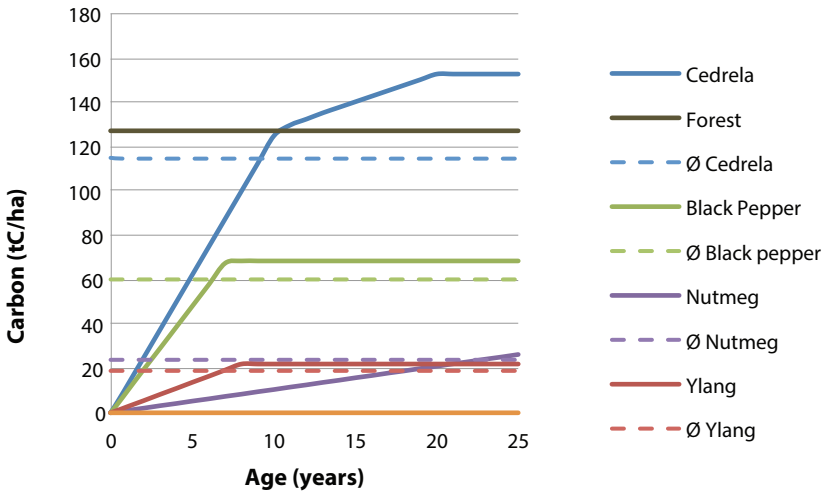


Figure 2: *Development of carbon stocks over 25 years for the various land-use systems of Portal Ltd.*

Note: ø = the average carbon storage during a time period of 25 years.

Discussion

The results indicate that timber plantations (e.g. *Cedrela odorata*) have the highest combined potential for carbon storage and economic performance, followed by rubber. Observations indicate that the performance of cocoa plantations could be improved with better spacing, which could increase the number of shade trees, the volume of stored carbon and yield (and thus income). Despite the low income, farmers say they prefer cocoa because of government support, better access to extension services and the importance of the crop in Ghana. Citrus, on the other hand, would only be profitable in a REDD+ scheme if market access was guaranteed. Essential-oil crops show high potential income and carbon storage if produced in agroforestry systems (e.g. black pepper climbing on gliricidia trees). An interesting combination planned by Portal Ltd would be to integrate shade-loving essential-oil crops such as vanilla in forest areas. In general, such a system would fit well into a REDD+ mechanism: conservation forests and trees on agricultural land serve as carbon sinks, while essential-oil crops promise high income for farmers as well as employment opportunities for other community members. To avoid losses due to unexpected market failures, short-rotation crops such as lemongrass, citronella and patchouli should be introduced first. For the community, it is

crucial that the land use is profitable even without potential carbon credits; thus, REDD+ payments would serve as an additional source of income. In practice, small-scale farmers in a REDD+ scheme would be advised to divide their land (with a standard size of 2.5–3 ha) as follows: 0.5 ha for timber plantations; 0.5 ha for essential-oil crops; 1 ha for tree crops such as cocoa or rubber; and 0.5–1 ha for food crops. In this way they could balance carbon benefits, economic feasibility and food security and minimize risk. Further constraints that need to be addressed are land and tree tenure, market access and extension services.

Conclusion

The proposed land-use system involving the cultivation of essential oils has good potential for REDD+; it could be expected to have a positive impact on carbon storage, farmers' livelihoods and employment opportunities in communities. Smallholders would be advised to employ a diversity of land uses involving traditional and introduced cash crops, timber trees and food crops. Black pepper is the most suitable essential-oil crop for REDD+. It is also preferred by farmers and should therefore be emphasized as the first cultivated essential-oil crop for smallholders.

Five year old rubber plantation in Bedum

3.3 POTENTIAL AND IMPACTS OF A SHEA PILOT PROJECT FOR OFF-RESERVE REDD+ IN THE KINTAMPO NORTH DISTRICT

Mixed cultivation with shea trees in Kintampo

Agriculture and forestry, two highly climate-sensitive sectors, contribute almost half of Ghana's gross domestic product (GDP), agriculture accounting for 40% and forestry for 6% (Central Intelligence Agency 2012). A sustainable management strategy for these two sectors, including climate-change adaptation and mitigation, should therefore be of primary importance.

It has been estimated that the degradation of natural resources costs Ghana 5–10% of its GDP, with forestry accounting for 63% of this cost (Forestry

Commission Climate Change Unit 2010). The country has recognized the problem and is promoting SFM and climate-smart agricultural management systems designed to make the primary sector "ready" for the future climatic environment. Remaining state-managed forest reserves are under serious threat of degradation; currently, only 8% (0.4 million ha) can be considered to be highly biodiverse and carbon-dense primary forest (FAO 2010). Forest land outside these forest reserves, known as "off-reserve", occupy about 4.5 million ha; off-reserve areas have a landscape mosaic structure of various agroforestry systems and are also under pressure of "flipping" from wood-dense to wood-poor landscapes.

Considering that climate change will further challenge the country's capacity for economic development, it is necessary to find new development pathways that offer potential win–win–win scenarios: the mitigation of greenhouse gases; improved climate resilience; and socioeconomic development. This chapter analyzes whether shea nut production (*Vitellaria paradoxa*; karité) constitutes a viable off-reserve REDD+ strategy capable of fulfilling these three objectives.

Objectives and methodology

The overall objective of this study was to assess the potential of enhanced shea nut production in the upper transitional zone of Ghana considering factors such as carbon relevance and the impacts on farming systems and people's livelihoods. The underlying hypothesis was as follows: "intensification of shea nut production in the Kintampo North district, supported by a tailor-made REDD+ mechanism, is possible and has the potential to sustainably increase people's income and reduce net greenhouse gas emissions from agricultural and forestry practices". This hypothesis was addressed by analytical work and field data. The analytical part of the study involved an in-depth literature review to determine the aspects that must be integrated in a pilot project. The strategy and impact of the proposed activities is based on socioeconomic data collection and biophysical measurements of nine case-study households selected using stratified case-study sampling.

Results and discussion

The results of the research show that five framework conditions need to be in place prior to project implementation to enable a transition in the farming system: 1) security of land, tree and carbon tenure; 2) an equitable, effective and efficient benefit-sharing system; 3) a long-term-oriented MRV system; 4) a market with advantageous terms of trade for shea collectors; and 5) private and public sectors able to provide technical knowhow on shea production aspects. If these conditions are in place, and long-term planning can be undertaken to guarantee that leakage and permanence are addressed, the research indicates that semi-intensive shea agroforestry systems can have positive impacts on both climate-change mitigation and people's livelihoods. The study shows that the extensive rotational agroforestry system that most farmers currently practise maintains carbon stocks at a stable but low level, with an average of 4.5 tC per ha in the last cropping year prior to fallow. Secondary forest before re-conversion to cropland often does not exceed 45 tC per ha. This land-use system can lead to emissions due to land-use change of up to 67 tC per ha (Figure 3).

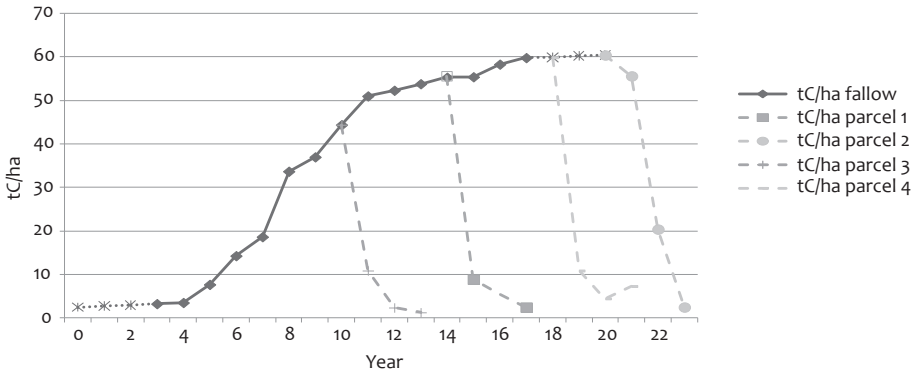


Figure 3: *Average carbon stock changes during fallow and the first three cropping years after conversion from fallow to cropland in four farm households in the Kintampo North district, Ghana*

Intensifying the shea production system to the extent that no annual crop yield is reduced (i.e. 25 fully established shea trees per ha) creates a carbon stock of at least 11.5 tC per ha in the cropping years. Under the model assumptions and a 20-year pre-pay system, this increment would generate an average compensation payment of US$17.9 per ha per year. Even without any direct payment for compensated emission reductions, the gross margins for annual

cropland would increase by 12–44% (assuming 2013 yields and prices). On the basis of the forecasted impact of global climate change on crop production in West Africa, we can additionally say that the resilience of households will increase if the importance of shea as a cash crop to total household income rises, because the risk of a "flip" from cropland to rangeland is not negligible. It is possible to identify all primary and most secondary stakeholders (beneficiaries, the private sector and the public sector) in implementing a shea production system, enabling the development of an initial project outline to decarbonize the sector, such as through rotational agroforestry.

Conclusion

The optimization of shea nut production through a system transition from exclusively wild harvest to a semi-intensive agroforestry system has the potential to achieve a "triple win" that offers climate-change mitigation, improved resilience to climate change, and socioeconomic development benefits. The likelihood of success depends on how successfully a range of challenges can be addressed, which depends in turn on local rules and regulations and the future market environment for both carbon and tradable shea butter. Beyond the mostly technical findings given above, some more general conclusions of the study are as follows:

- **Land and tree tenure** must be considered as a cornerstone and needs to be addressed at an early stage of implementation. Carbon rights are more complex to address because they are not yet defined by Ghanaian law. To incentivize participation, a pilot-based tree tenure agreement could be a first step in avoiding predatory use during the pilot phase. The legal pluralism nature of land tenure adds considerable complexity to this activity and is stamped by past failures of attempts at resolution.
- **Agricultural intensification** alone will not yield the desired effect. Indeed, it risks accelerating deforestation because it is does address the root causes.
- The suggested activities **do not refer to a reference level**. This has the advantage of allowing faster implementation but considers additionality to be "just" the additional carbon in shea trees. This is problematic because it risks either the over – or under-estimation of additionality.

- The **opportunity costs for REDD+ are low** in the Kintampo North district. A concentration of pilot activities in the transitional zone in a first stage makes sense because direct foreign investment in crops (as in the south) is unlikely.
- The wild shea tree is a slow-growing species, which is an obstacle to the participation of rural farmers in projects that intend to increase the shea population. The use of **domesticated varieties** (obtained from the Cocoa Research Institute or the University for Development Studies) is a central success factor because it provides early yields as well as yield stability and reliability and disease tolerance, which incentivize the participation of farmers. Helvetas Swiss Intercooperation's Shisun Project in Mali could serve as an example in the transplanting of young seedlings, direct seeding, grafting, practices of assisted natural regeneration, and sanitary and rejuvenation cutting.

3.4 INCENTIVE MECHANISMS FOR THE ADOPTION OF SUSTAINABLE LAND-USE PRACTICES BY FARMING COMMUNITIES

Young yam and cassava farm

Various (formal and informal) fiscal and financial incentive schemes are in place to encourage farmers to sustainably manage forests and agricultural lands (Lindhjem et al. 2010). Among them are the modified taungya system,

which aims to rehabilitate degraded forest reserves with food and tree crops to improve farmer livelihoods and the environment; and a system for sharing the stumpage fees generated by the sale of commercial timber species in and outside forest reserves. In the agricultural sector, existing sharecropping systems are examples of benefit-sharing because crops are shared in agreed parts: one-half in "abunu" farming systems, and from one-third to two-thirds in "abusa" systems. Although these schemes and systems generate benefits for farmers, the activities of non-titled and tenure-insecure farmers continue to contribute to deforestation in Ghana (Damnyag et al. 2012; Leach and Fairhead 2000).

The adverse impacts arising from informal farmland benefit-sharing arrangements are not restricted to tenants and migrant landholders: it appears that the landowners themselves are not satisfied with formal arrangements for sharing the revenue generated by trees on their lands. The constitutional beneficiaries (stools/chiefs) complain of the low level of benefits they derive from trees on their farmlands, and leasehold and sharecrop farmers receive no benefits at all under the prevailing timber revenue-sharing system (Damnyag et al. 2012). Despite policy reform under Ghana's Forest and Wildlife Policy (Forestry Commission 2012), a number of challenges remain, including the distributional mechanism for, and weighting of, REDD+ payments among landowners and users at the farm level (Damnyag et al. 2012; UNCCD 2012). The study reported here was prepared under Activity 2.3 of ITTO project RED-PD 093/12 Rev. 3 (F) in an effort to fill part of this knowledge gap in the REDD+ payment distribution at the farm level. The study's specific objectives were to analyze farmer perceptions of REDD+ benefits distribution using six communities in three proposed national REDD+ pilot project sites; and to provide guidance on REDD+ benefit-sharing at the forest and farm level.

Methodology

The study was conducted in two communities each in the Aowin-Suaman (New Yakasi and Adonikrom) district in the Western Region, the Asikuma-Odoben Brakwa (Bedum and Brakwa) district in Central Region, and the Kintampo North Municipal (Dawadawa no. 1 & 2 and Tahiruu and Attakuraa) district in Brong Ahafo Region. The criterion used in selecting these districts and communities was participation in one of the three proposed national REDD+ pilot project communities. A questionnaire was used to collect data through individual interviews conducted in June 2013. Data were collected to determine, among

other things, the socioeconomic characteristics of the respondents; suitable beneficiaries of REDD+; reasons why stakeholders should benefit; the preferred forms of benefit; and how REDD+ compensation could be used to reduce deforestation and forest degradation.

Findings

Farmer perceptions of REDD+ benefit distribution

In all three districts, farmers appear to be the most important beneficiaries of REDD+. This may be justified on the grounds that they are engaged directly in REDD+ activities and work on the land on which such activities take place. Other important beneficiaries in the Aowin-Suaman and Asikuma Odoben Brakwa districts are the communities and landowners. In the Kintampo North Municipal district, the beneficiaries include the traditional rulers, opinion leaders and the community as a whole. Taking care of the welfare of the community and land ownership were two reasons provided to justify the inclusion of opinion leaders in the list of beneficiaries of REDD+. The question arising from such a wide range of beneficiaries is whether payments would be sufficient to encourage the adoption of conservation agricultural practices (MLNR–FIP 2012). Another key result is that most surveyed farmers indicated that benefits should be distributed on the basis of the quantity of greenhouse gas emissions reduced through REDD+ activities. Equal payments—where all households receive the same amount irrespective of their contributions to emission reductions—was the least preferred option among surveyed farmers. The preferred level for the transfer of REDD+ benefits was the household, while the community was the least preferred level. Reasons for preferring households for the distribution of REDD+ benefits were: that households work on the land where the emission reductions are achieved; to avoid the misappropriation of funds; and to motivate farmers to nurture trees on farmlands.

REDD+ benefits to minimize deforestation and forest degradation

Activities carried out in the study districts to enhance forest conservation varied widely. Important measures were forest plantation establishment on farmlands and agroforestry in the Aowin-Suaman district; nurturing trees on farmlands in the Asikuma-Odoben-Brakwa district; and afforestation in the Kintampo North Municipal district. An important implication of this result is that the distribution of REDD+ compensation could be targeted at farmers who

engage in such conservation activities. On the other hand, actors who degrade the environment through activities such as bush fires, charcoal production and illegal chainsawing and farming would have to be managed and their activities curtailed (Lindhjem et al. 2010).

Guidelines for REDD+ benefits distribution

The effective distribution of REDD+ benefits involves the following steps: identifying the actors/beneficiaries of REDD+; determining existing processes that could be used in the allocation of REDD+ benefits; and deciding the most appropriate means for delivering benefits. The distribution process must ensure the inclusion of all social groups that have a stake in REDD+ benefits and co-benefits. The current wide range of beneficiaries implies that some key actors, such as migrant farmers, may not be benefiting adequately from REDD+, and measures may be needed to ensure their involvement, including in decision-making processes on REDD+. Benefits should be weighted on the basis of the performance of households that undertake REDD+ activities (Mwayafu et al. 2011).

Concluding remarks

This chapter sheds light on the distribution of REDD+ benefits at the farm level. The main findings are that there is a wide range of beneficiaries of REDD+ compensation at the farm level; and REDD+ intervention and benefit distribution should focus on the household, while not overlooking the community as a whole and the composition of the household. Economic feasibility, local institutional capacities and governance structures, and the effects on local economies, should carefully be weighed and assessed to assist in the identification of an all-inclusive REDD+ benefit-distribution scheme. Given that community preferences may change over time, they should be assessed periodically and the distribution mechanism adjusted accordingly (Mohammed 2011).

3.5 COST–BENEFIT ANALYSIS OF POTENTIAL REDD+ PILOTS WITH *CEDRELA*, YLANG-YLANG AND SHEA

Ylang ylang plantation in Bedum

This case study investigates the financial viability and potential of benefit-sharing options for the Bedum and Nkoranzaman REDD+ pilot projects. The Bedum project addresses the potential for cedrela (*Cedrela odorata*) plantations and ylang-ylang (*Cananga odorata*) essential-oil production in combination with an outgrower scheme, and the Nkoranzazman project focuses on shea nut production. The study site of the Bedum project is located in the Asikuma-Odoben-Brakwa district, where the predominant economic activity is the

farming of staple and cash crops, particularly oil palm, cocoa, citrus (oranges) and rubber. Data on the costs and benefits of these four crops were collected through exploratory interviews with six farmers and verified in discussions with district extension service staff. Data on the costs of labour, inputs and seedlings, as well as average sales revenues, provide a baseline against which alternative crops can be compared. Figure 4 depicts the expected development of costs and benefits over the first 20 years.

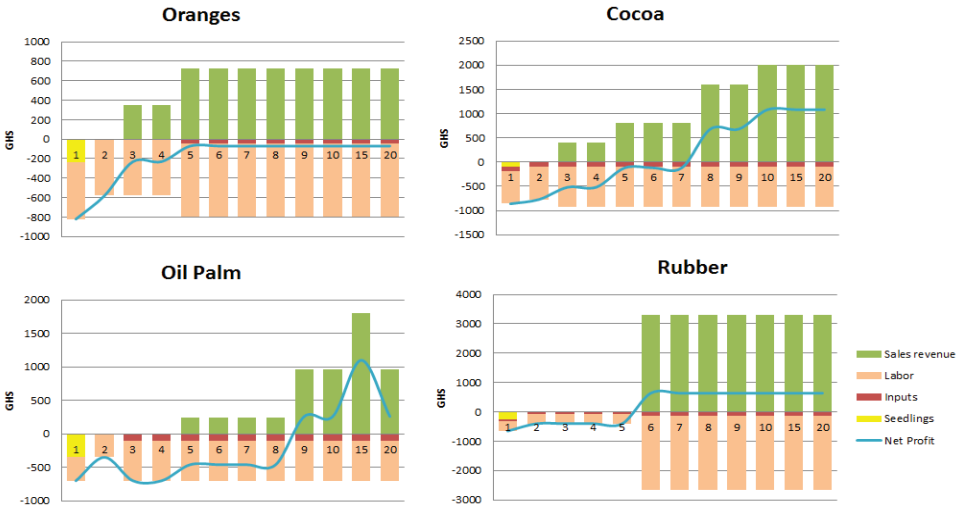


Figure 4: *Costs and benefits of four cash crops typical for the Bedum area*
Note that many plantations can be harvested for longer than 20 years (e.g. cocoa and rubber for 40 years and oil palm for 30–35 years).

In the current situation, orange plantations are not profitable, partly because of low sales prices and the unreliable purchasing strategies of a local fruit juice company, and partly because of an infestation of fruit flies. Cocoa, by contrast, is perceived to be a very profitable crop that benefits from state support and bears little risk. Pests and diseases are significant issues, however, the control of which entail the use of high amounts of pesticides; moreover, income is irregular because the workload is seasonal according to harvesting times. Benefits of oil-palm plantations include market stability and the possibility of harvesting side-products such as mushrooms for home consumption. However, farmers also mentioned the high workload associated with oil-palm plantations and the lack of potential for intercropping due to early canopy closure. Rubber plantations are perceived to be very profitable and labour-intensive, but farmers were hesitant to develop such plantations because of concerns about market stability and a lack of experience. Thus, rubber may

be suitable as a diversification strategy for large cocoa farmers who have sufficient liquidity to hire tappers.

New alternatives considered in this study are cedrela and ylang-ylang. Data on the costs and benefits of these options were obtained from a local entrepreneur in Bedum district. For a 10-year-old plantation of cedrela, outgrowers could expect to receive GH¢3600 per acre (US$4386/ha), but accumulated costs are likely to exceed GH¢6100 per acre by the time the plantation is mature. Intercropping with plantain, chilli, cowpeas, corn and ginger are viable options that would add to potential income. There is less clarity on the expected sales revenue for ylang-ylang; for it to be profitable, prices would need to cover the sizeable harvesting cost (GH¢113 320 per acre) plus an annual maintenance cost of GH¢360 per acre and an initial investment in seedlings of GH¢666 per acre. Ylang-ylang is seen as a pro-poor crop because it can be grown in backyards and does not require much upfront investment, but farmers expressed concern over the high dependency on a single buyer of ylang-ylang flowers.

The Nkoranzaman project aims to conserve and enhance agroforestry systems, mainly by conserving remaining shea trees and possibly by fostering the planting of single trees in croplands. Farmers currently lack incentives to plant trees because the government has property rights over individual trees and charcoal producers also exert considerable pressure on tree resources. The proposition investigated in this study is the implementation of a Community Resource Management Area (CREMA), which would decentralize management rights and offer better prospects for sustainable income from natural resources. Because women predominantly collect and process shea nut, the community's women's group could establish a CREMA. The group could even obtain full property rights for the trees by planting an entire registered plantation rather than individual trees. Furthermore, the establishment of a community-based nursery for shea trees by the women's group has been discussed and approved as worthy of further consideration. The results of this discussion are summarized as a SWOT analysis in Table 2.

Table 2: *SWOT analysis for the establishment of a tree nursery by the women's group*

Strengths	Weaknesses
• Availability of low-cost seedlings	• Government ownership of trees on farmland
• Sufficient water available for nursery	• Concern over delayed benefit flows
• Approval of village head and willingness to provide land for a nursery	• Group membership fee of GH¢1/month
	• Exclusion of women unable to attend meetings

Opportunities	Threats
• Access to seedlings, additional income	• Cattle raiding newly planted trees
• Opportunity to grow cashew and mango	• Theft of trees for charcoal/ wood production
• Group is well-established, with strong leaders	• Village head is only a tenant
	• Youth may lack interest in plantation work

The study concluded that ylang-ylang and rubber in the south, and shea trees in the north, are potentially good sources of diversification for local (women) farmers under a REDD+ system. However, ylang-ylang and shea butter are still niche products and demand depends on only a few buyers. Rubber has the disadvantage of price fluctuations, which can affect small-scale farmers disproportionately. In combination with potential REDD+ performance payments for ylang-ylang or shea cultivation, farmers will need adequate technical assistance in business and crop management. In addition, stakeholder involvement needs to be assured and tree tenure issues clarified.

3.6 LESSONS LEARNT FROM COCOA CERTIFICATION FOR REDD+ IMPLEMENTATION

Woman drying cocoa in Sewum

The study summarized in this chapter assessed if and how the certification of cocoa in Ghana could inform the implementation of REDD+ projects in off-reserve areas. There has been an increase in the implementation of cocoa certification because the cocoa industry is trying to secure its supply base from smallholder farms with generally low productivity. Given that cocoa

agroforestry systems can be viewed as an opportunity for REDD+ projects, the study analyzed the following:

- What are the hindering factors in the context of carbon stock enhancement on cocoa farms?
- How could the two initiatives complement each other?
- What certification challenges can help inform REDD+ implementation at the farmer level?

Context of tree management on cocoa farms

Traditionally, cocoa has been cultivated under shade-giving plants, especially when plants are young. More recently, however, low-shade systems have been advocated, and young farmers in particular seem to prefer hybrid full-sun systems (Ruf 2011). Official recommendations are to keep 15–18 trees per ha on mature cocoa farms, or about 40% shade (CRIG 2010). In our survey, farmers assessed the number of trees on their cocoa farms at an average of only 11 trees per ha (although the range was large). Thus, there is potential for more trees on cocoa farms, especially in the Western Region (where the current average is 8 trees per ha), combined with appropriate pruning to avoid overshading.

The incentive for farmers to keep timber trees on their farms is limited, however, by at least two observed factors. One of these is the damage caused by logging on cocoa farms. The extent of logging differs among the studied communities: in two villages, around 50% of respondents reported that logging companies or small-scale chainsaw operators had taken timber trees from their cocoa farms at least once; the percentage was 15–20% in three other villages and below 10% in two. In areas with extensive logging, farmers perceive certain timber tree species as a risk to their cocoa farms and often choose to eliminate them.

The study assessed the extent to which farmers take advantage of opportunities offered by the Timber Resource Management Act (617/2002). This legislation was enacted to encourage farmers to grow timber trees by giving them the right to benefit from harvesting timber if they register the trees they plant with the local Forest Services Division offices. Naturally occurring trees are viewed as a government-owned natural resource. The study concluded that the need to register planted timber trees to claim ownership in the future is not yet common knowledge, which is another factor limiting the incentive for farmers

to grow timber trees on the land they cultivate. Of 185 survey respondents in the Ashanti, Eastern and Western regions, only six had actually registered timber trees they had planted. The principal reason for this lack of registration was a lack of knowledge, and the cumbersome nature and costs of the process were also mentioned. The legislation is thus not yet in practical use.

It is therefore unsurprising that respondents prefer to plant fruit trees rather than timber trees because fruit trees have immediate economic value. In addition to the difficulty of obtaining appropriate seedlings, the risks involved with timber trees on cocoa farms are higher. Two conclusions can be drawn. First, the preference for fruit trees means that multiple-use trees need to be integrated in carbon-enhancing strategies. Second, REDD+ in off-reserve areas needs to be developed in an environment in which the agricultural and forest sectors work together to accomplish common goals.

Complementing REDD+ and certification

The idea of combining REDD+ with cocoa certification is not new, and several initiatives are already under development. Our study showed that surveyed wcertified farmers estimate a significantly higher number of trees on their farms compared with conventional farmers (p=0.036). For timber trees only, the significance is even higher (p=0.012). Certified farmers also show a greater willingness to plant trees and a higher awareness of the importance of shade trees on cocoa farms. We can therefore say that certified farmers' groups, which are already organized for knowledge dissemination and which have a higher awareness of the importance of shade trees, could be an interesting entry point for REDD+ projects. Training schemes are already established and could be enhanced with CSE modules on cocoa farms. Farmers appreciate the training of certification implementers because it helps them to considerably increase yields. In addition, certification schemes already have premium sharing systems. In the communities where farmers are satisfied with the system, such schemes could be used in a similar way for the distribution of benefits (monetary and non-monetary, such as seedlings, equipment or community enhancement projects) arising from REDD+ projects.

Challenges of combining REDD+ with cocoa certification

Surveyed farmers perceive certain challenges in the system used to distribute benefits of certification to them. Often, this has to do with the (lack of) transparency and communication in the system. Farmers find that their needs are not adequately taken into account and perceive a gap between what has been promised to them and what they actually receive. In some cases, the lack of information and communication may have been an effect of the rapid growth in the number of certified groups. The conclusion for REDD+ is that, taking into consideration the potential of REDD+ as well as the uncertainties associated with carbon markets and the costs of implementation, it is advisable to not raise hopes about monetary benefits that might be difficult to fulfill, at least in the short run. Cocoa certification implementers have lost the trust of farmers in this way, and unfulfilled promises are held against them. The capacity of local implementers to establish good, regular communication in a two-way process (in contrast to the top-down dissemination of information) is crucial, therefore, for the implementation and maintenance of a functional benefit-distribution system.

Cocoa certification also shows that the organization of farmer groups—which will be necessary for REDD+ schemes if they are to attain sufficient scale—is no simple task. A first step would be to understand existing social structures and identify organized groups in which trust is already established. The study also found that the category "farmers" needs differentiation so that farm-owners are not privileged over sharecroppers, who are common in some cocoa-growing regions.

Finally, a community approach must be sought that does not contribute to social imbalances within communities. As demonstrated in the case of cocoa certification, benefit-distribution systems run the risk of aggravating inequalities when certain people do not have access to organized groups because they lack basic education or have difficulties with the credit systems on offer. This underlines the need for the careful implementation of REDD+ safeguards.

4 Framework Conditions

4.1 THE EVOLVING REDD+ LANDSCAPE IN GHANA

REDD+ is a dynamic and continuously evolving space in Ghana, especially given that the country is still engaged in the very first phase of REDD+, "REDD+ readiness", which involves developing and building the needed architecture, systems, processes and guidelines for REDD+ implementation. The REDD+ readiness phase is expected to be completed by the end of 2015, which will signal the beginning of full-scale implementation. Already, new opportunities and thinking are influencing the likely structure and manner in which REDD+ will be implemented and the way in which it will work. This chapter provides an overview of important developments and initiatives.

Reference level

REDD+ countries must designate national or subnational reference levels. A national **reference level** quantifies a country's total carbon stocks and emissions, whereas subnational reference levels account for emissions and enhancement at smaller scales, typically those of a subnational state, region or landscape; taken together, the subnational reference levels add up to a national reference level. Ghana has opted to establish **subnational reference levels** that will be differentiated according to the country's different ecological zones due to the widely varying carbon stocks, deforestation rates and drivers in those zones. A reference level is like a project baseline except that it covers a much larger area. The benefit of having an established reference level is that it takes out much of the technical work of project development because the "baseline" carbon values, deforestation rate and emission reduction potential have already been determined. With an established reference level, projects simply have to adopt the associated values at their project scale. By coordinating with the national secretariat, a "cookie-cutter" approach can be used to determine the total potential emission reductions that a project can adopt. The key point here is that the total emission reductions of all projects operating within the reference-level area cannot exceed the total potential

emission reductions of that area. Although Ghana has committed to developing its national reference level for deforestation via subnational reference levels, it is possible it will also establish national and subnational reference levels that account for forest degradation and CSE. When CSE is included, it is technically referred to as a "forest reference level".

Jurisdictional and programmatic REDD+

Two issues have come to the forefront of REDD+ discussions in recent times: the question of how to deal with the sovereignty of subnational states within national REDD+ initiatives being implemented in federal systems; and the recognition among the many proponents of REDD+ that implementing at the project scale is exceedingly complex and costly and is unlikely to furnish significant mitigation benefits in the short to medium term. The second issue, project-scale implementation, has proven to be a challenge in Ghana, largely because funds to support early actions such as piloting are limited, difficult for many local proponents to access, and rarely made available in a timely manner. In addition, the necessary in-country capacity and technical resources are still low.

Among thought-leaders in the REDD+ space, discussions around jurisdictional, nested and programmatic approaches have gained significant ground as a means of resolving both issues. Although the terms used to describe it vary, the basic premise is the same—pursuing REDD+ at a landscape or jurisdictional (state) scale provides an **efficiency of scale** that is highly attractive from financial, policy, technical and legal standpoints.

According to the Verified Carbon Standard, a jurisdictional, nested framework offers many important benefits for participants (VCS 2013), including the ability to:

- monitor, quantify and reward emission reductions across an entire jurisdiction, maintaining environmental integrity;
- increase the potential for emission reductions as a result of working at a larger scale;
- provide incentives to drive REDD+ through government policies and programmes as well as projects;

- build on project experience and provide a pathway for the recognition of "early action" projects and programmes;
- create potential for harmonizing market and public REDD+ funding streams by serving voluntary, bilateral, multilateral, pre-compliance and potentially compliance markets through the use of a consistent, independent framework; and
- increase the funding available for REDD+ implementation.

Ghana is now one of the leading countries on programmatic REDD+ because it was selected to enter the pipeline of the Forest Carbon Partnership Facility Carbon Fund **Emission Reductions Programme**. The Carbon Fund will provide performance-based payments (up to US$50 million) to about five countries that have made significant progress in their REDD+ readiness endeavours. Ghana's **Emission Reductions Programme for the Cocoa Forest Mosaic Landscape** proposes to cover the entire HFZ with the aim of reducing emissions driven by cocoa farming and other agricultural activities. It would adopt an integrated strategy that includes collaboration between major government institutions, policy reforms, and the implementation of strategic activities with communities, traditional authorities, the private sector, non-governmental organizations and other key stakeholders. If REDD+ readiness is completed successfully and the Emission Reductions Programme for the Cocoa Forest Mosaic Landscape is well designed, Ghana will have the opportunity to enter into an Emission Reductions Purchase Agreement with the Carbon Fund.

This would mean that any project-scale effort within the area of the Emission Reductions Programme for the Cocoa Forest Mosaic Landscape would have to be integrated with the Programme. In so doing it would benefit from the Programme's reference level, forest monitoring system, policy work and heightened importance and attention among multiple stakeholders and donors.

4.2 CARBON RIGHTS LEGISLATION AND MANAGEMENT

Cocoa farm with ringed tree

Ghana's legal framework presents a complex environment for REDD+ because ownership and management rights to land and natural resources do not align and carbon is yet to be legally defined. The 1992 Constitution decoupled land and natural resources (Republic of Ghana 1992), resulting in a scenario in which private land is owned by stools but the management rights to the resources on the land, such as forests and timber, rest with the government. For REDD+ to work, however, ownership and management decisions—both

formal and informal—must come together. The landowners must consent to a REDD+ action, but stools would not have the ability to influence the formal management of trees or forests because this is the domain of the Forestry Commission, and nor could it fully influence the deforestation and degradation occurring informally as a result of agricultural expansion or illegal timber harvesting. Consequently, REDD+ initiatives will need to take into account multiple stakeholders and ensure that benefits are distributed adequately among landowners, resource managers and other land and resource users.

Ghana has approximately 1.6 million ha of gazetted forest reserves, for which the Forestry Commission has the management authority, although the land is still recognized as belonging to stools. This land is referred to as "on-reserve". Private land outside forest reserves is called "off-reserve" and comprises roughly two-thirds of the land in Ghana. It is largely owned by stools and managed and used according to traditional norms that support multiple user rights. Landowners and land users, however, do not have economic rights to naturally regenerated trees (timber) because management rights rest with the Forestry Commission. Consequently, there is nothing in the law that prohibits the felling of off-reserve trees for non-economic purposes, such as to clear land for agriculture, but legally farmers and forest users are not allowed to harvest and sell timber without a permit.

In the event that natural resources are harvested from forest reserves or private land, the government shares a proportion of the revenue with the landowner under a legally backed benefit-sharing arrangement. The benefit-sharing arrangement, however, does not compensate the actual land user, who in many instances is not the same as the landowner. Consequently, the land users who make *de facto* decisions about trees and forest patches do not benefit from their efforts and are not compensated for their losses. In the case of timber harvesting on stool lands, the Forestry Commission takes 50–60% of the stumpage fees, depending on whether the trees harvested are off-reserve or on-reserve. The remaining revenue is divided according to a constitutionally agreed formula between the Office of the Administrator of Stool Lands, the stool, the traditional authority and the district assembly.

From a REDD+ standpoint, the benefit-sharing arrangements for plantation development or modified taungya systems are more agreeable because they directly compensate or allocate rights to the actors that are responsible for planting and managing trees.

To date, there is neither a legal definition of carbon nor legislation affecting the right to manage or transact carbon. Even though the 2012 Forest and Wildlife Policy emphasises the non-consumptive values of forests, it only cites the need to take strategic policy and legislative action on these issues and gives no indication of how carbon assets and rights are to be allocated, what types of tax structures could be implemented, or how REDD+ benefit-sharing regimes would need to be structured to support the development of REDD+ projects.

The existing complexity of land and tree tenure and the lack of clarity on carbon are barriers to progress on REDD+ at a project scale. In the short to medium term, however, mechanisms exist to help create pathways towards REDD+ implementation. The CREMA mechanism is a community-based platform that devolves natural resource management rights to communities through a CREMA authority or board, which in principle aligns with the land ownership of the traditional authority. CREMA is a landscape-level planning and management tool that gives communities the right to manage their natural resources for economic and livelihood benefits. This management authority is transferred to a fully functional CREMA in the form of a certificate of devolution that is signed by the minister (CRMU 2004).

Originally developed by Ghana's Wildlife Division as a community-based platform for wildlife management, the CREMA concept has evolved to allow the management of other types of natural resources, products and economic revenue streams, including NTFPs and ecotourism. Nationally, approximately 26 CREMAs have been approved officially or are in various stages of development (Asare et al. 2013). On average, CREMAs cover about 25 000 hectares, but they can range in size from a few thousand hectares up to a few hundred thousand hectares (Asare et al. 2013). Each CREMA has a constitution and bylaws that guide and regulate activities within the CREMA area. Each CREMA is managed by an executive committee or management board, and revenue is shared among the members, with typically 5–10% going to the executive committee and the remainder to the communities for development purposes (Asare et al. 2013).

CREMAs are officially articulated in Ghana's readiness preparation proposal, and early thinkers on REDD+ in Ghana have noted that it could help solve many of the challenges to developing early REDD+ projects, including by: providing clearly defined project boundaries; aggregating smallholders across a landscape; ensuring free, prior and informed consent; ensuring permanence

of the carbon assets; preventing leakage outside the project area; and informing equitable benefit-sharing arrangements (Asare et al. 2013).

CREMA may also help bridge some of the legal gaps with respect to carbon ownership and rights. The argument has been made that because the CREMA devolves management authority and economic rights to CREMA communities (as represented by their management boards), the carbon rights are, by default, transferred to the CREMA, too. The extent to which the CREMA mechanism can clarify carbon rights is still limited, however, because no legislation provides specifically for the establishment of CREMAs. CREMAs do not derive their structures from the Constitution or from any law and therefore they are not directly recognized as legal entities to the same extent as companies or associations incorporated under Ghanaian law. CREMAs can fit into existing corporate forms, however, and nothing prevents them from registering as legal corporate entities, including as cooperatives, community-based organizations, companies limited by guarantee, or limited or unlimited companies (Agidee 2011).

In the short to medium term, the question of carbon's definition and the legal rights to manage and transact carbon remains a significant risk for the development of REDD+ projects. Therefore, a serious effort is needed to explore the legal options and to move legislation forward in a reasonable timeframe. The government, especially the Forestry Commission, may be eager to think of carbon as a natural resource, but it should weigh the liability (non-permanence of carbon and challenges in demonstrating emission reductions/CSEs against projected reference levels) it may bear associated with such a definition, as well as its capacity to "manage" carbon storage or sequestration. Alternately, the government could define carbon as an ecosystem service.

5 Concluding Remarks on the Way Forward for Off-Reserve REDD+

Reducing deforestation and forest degradation requires that: existing forest stocks are legally protected and kept healthy; no more than the average of a forest's net growth is removed; and there is a means of enhancing regeneration and growth. These technical requirements must be complemented with appropriate socio-political and economic arrangements that make SFM rewarding and attractive to stakeholders. However, both the technical and governance arrangements for sustainably managing Ghana's off-reserve forest resources are presently minimal and largely ineffective. The underlying factors that have fuelled the rapid conversion of off-reserve forests include insecure tenure rights; government policies that favour the conversion of off-reserve forests to other land uses; population increases; and institutional weaknesses.

Ghana's readiness preparation proposal suggests that one of the major weaknesses of the forest management framework is the lack of an appropriate mechanism to incentivize the conservation of native trees in off-reserve areas. REDD+ offers an opportunity for the requisite policy reforms and incentive scheme to be put in place to confront and overcome the driving factors that account for forest loss in off-reserve areas. Thus, the ITTO project that generated the case studies presented in this report sought to identify strategies that simultaneously reverse agriculture's adverse effects on forests and trees (and therefore carbon emissions) and enhance the environmental services that off-reserve forests and trees provide.

In recent years, key policy reforms have been undertaken in Ghana that aim to enhance environmental integrity and incorporate the objectives of REDD+ in forest management and climate-change strategies. Ghana's revised Forest and Wildlife Policy (2012) recognizes the importance of REDD+ in the enhancement of livelihoods and the achievement of SFM. The policy also acknowledges the importance of restructuring tree tenure in off-reserve areas for the effective management of off-reserve forests. The national Climate Change Policy (2013) incorporates REDD+ as a key component of Ghana's mitigation, adaptation and low-carbon growth agendas. Ghana's Strategic Growth and Development

Agenda (2010–2013) encourages the reforestation of degraded forests and off-reserve areas.

Initiatives focused on SFM that complement Ghana's REDD+ efforts will enhance the implementation of REDD+ in off-reserve areas. The Voluntary Partnership Agreement with the European Union under its Forest Law Enforcement, Governance and Trade Action Plan, and the Non Legally Binding Instrument on All Types of Forests, could both complement future REDD+ interventions, particularly in off-reserve areas where deforestation and forest degradation are particularly problematic.

In 2010, Ghana submitted 55 nationally appropriate mitigation actions (NAMAs) to the United Nations Framework Convention on Climate Change. Eight of these NAMAs are forestry-based and include REDD+-related activities. Much work has been done since 2010 to make REDD+ a key component of Ghana's climate-change mitigation and adaptation strategy. Ghana's REDD+ readiness process is nearing completion, and a REDD+ package that will outline Ghana's REDD+ strategy and framework for safeguards, among others, will be completed by 2015. Thus, with the anticipated global climate-change agreement in 2015, Ghana will be in a good position to incorporate REDD+ as a key mechanism for climate-change mitigation (and adaptation) in its commitment to the post-2020 implementation of such a global agreement.

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ISBN: 978-9988-2-0238-5