Towards sustainable cacao: assessing governance strategies and their theories of change in Côte d'Ivoire

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Executive summary

Côte d'Ivoire is the largest cocoa producer worldwide. Despite their leading role in producing the highly demanded fruit, high deforestation rates, poor cocoa farmers and non-resilient livelihoods arise from cocoa farming. This seminar paper examines the highly vulnerable commodity sector in the South-West of Côte d'Ivoire. Within the Nawa region one of the last intact rainforest ecosystems, inhabited by endangered primates and other rare flora and fauna, face the advancing deforestation induced by cocoa. Theory of change is used to analyze pathways for entry to transform the sector into a sustainable system. Voluntary standards / certifications, agroforestry, and the "novel" approach Community resource management area (CREMA) represent the three selected intervention types. Using CREMA to enable community-based governance at the landscape level combined with agroforestry and certification promises an advancement in improving farmer's resilience and guaranteeing a sustainable deforestation-free cocoa. Despite no current implementations of CREMA in Côte d'Ivoire, the mechanism shows a promising way forward to achieve structural change within cocoa production

Table of Contents

List of figures

1. Introduction

1.1 Problem statement

Overall, cocoa production is characterized by multiple and intertwined problems. In addition to common environmental issues such as deforestation and water pollution, socio-economic problems appear, such as low incomes and child labor (Ingram et al., 2018).

Cocoa plays a crucial role in Côte d'Ivoire's agriculture. The cash crop amounts to 40% of export crops and accounts for 14% of the growth of domestic product (GPD). Two-thirds of the population in Côte d'Ivoire work within the cocoa sector. In the last four decades, the western-African country doubled its total production of the good and expanded its harvesting area upward to 3.52 million hectares. Expanding cocoa plantations imply an increasing use of fertilizers and intensified agriculture. Besides, land-use changes from forest and conservation areas into monoculture plantations were necessary to expand to its current size in Côte d'Ivoire. These changes affect the environment immensely as deforestation leads to soil degradation, biodiversity losses, and nutrient depletion. As a result of unsustainable cocoa farming losses in yield per hectare is an immediate short-term impact (Kouassi et al., 2021).
Currently, concern about greenhouse gases (GHG) associated with cocoa farming is rising, and the need to transform the sector into a more climate-friendly system is evident. Less GHG emissions, more efficient carbon storage, and higher yields represent targets for environmentally safe cocoa production (Vervuurt et al., 2022).

These problems represent only a few of the occurring challenges in the cocoa sector. The global pressure on food production certainly has its impact, and the tele-coupled nature amplifies the complexity of cocoa farming even more (Carodenuto & Buluran, 2021).

Various initiatives and stakeholders are trying to find a way to transform the current operations in Côte d'Ivoire into a more sustainable production. Economic growth as well as conservation and rehabilitation of natural ecosystems are equally viewed as main targets for the government. Commitments such as "reducing emissions from deforestation and forest degradation (REDD+) or a new Forest Code in 2019 to reestablish forest cover to 20% on a national scale show the ambitious engagement of the Ivorian government (EUREDD, 20123).

1.2 Introduction of landscape

Originally, the epicenter of cocoa production remained in the eastern part of the country. Since the 1970s, the cultivation area shifted to the west. Migrating production areas is termed the "cocoa loop" (Sabas et al., 2020).

In southwestern Côte d 'Ivoire the Nawa region remains the last biome containing intact primary rainforest (Taï national park). Until 2015 about 70% of forest cover disappeared and was turned into cocoa producing monocultures. The mostly remaining intact Taï national park and its biome is significantly under threat of becoming cropland for cocoa production (Ongolo et al., 2018). This region is well suited as a study area due to the increasing cocoa cultivation and its biodiversity biome.

1.3 Target areas and intervention types

Since cocoa production in Côte d'Ivoire drives deforestation tremendously, the primary focus of this paper is reducing deforestation and exploring a more climate-friendly production. Furthermore, the

papers center around increasing farmer's resilience, such as climate change, and incomes. Finally, linked to climate change and sustainable production, biodiversity conservation represents an additional target of the proposed set of interventions.

One of the intervention types, quite established in the scientific literature represents certification schemes. Linking certifications to cocoa production and agroforestry promises socio-economic as well as ecological benefits (Ingram et al., 2018). Opposed to most initiatives working with certification schemes, an integrative landscape approach offers more opportunities to generate sustainable cocoa production. Community resource management area (CREMA) as a landscape level mechanism offers promising opportunities to transform the cocoa sector in Côte d'Ivoire. This ultimately means going beyond certification and public private partnerships (Ingram et al., 2018).

While the benefits of agroforestry are known, intensifying cocoa cultivation based on cocoa price pressures and food insecurities towards full monocultures is observed. Due to a high global demand for cocoa, famers tend to decrease shade intensity and species richness on their farms (Vaast & Somarriba, 2014). However, intensification does not necessarily provide better financial outcomes in the long-term. The use of shade trees and a high degree of tree diversity represents the second intervention type, proposed in this seminar paper.

CREMA is a governance mechanism at the landscape level. CREMA was established in Ghana by the Wildlife Division to manage the wildlife within and around protected areas. CREMA can be characterized as locally defined area within two or three communities. The government transfers the authority to manage the natural resources within its boundaries to the CREMA. According to legally defined set of rules the members of the CREMA engage in a democratic decision-making process and define on how the natural resources are managed (Baruah et al., 2016). Since this approach is currently implemented in almost 30 regions across Ghana, CREMA is used as a third type of intervention in Côte d'Ivoire.

1.4 Research goals

Within the scope of the seminar the following research questions will be addressed:

- What are the key challenges and prospects for sustainable development in the selected landscapes?
- What are the main institutions (laws, policies, agencies) that govern decision-making regarding land use and sustainable development in the selected landscapes?
- How do selected intervention and governance strategies contribute to achieving sustainability for cocoa producers, in selected production landscapes and supply chains? What are the main pathways to impacts?
- Under which conditions can the strategies generate expected positive impacts on the selected targets, what are unintended impacts?
- What are their strengths and limitations to drive the transformation towards sustainability in the selected landscape and the cocoa sector more broadly? What are key implications for practice, policy and research?

The first two bullet points are already addressed in the introductory part of this paper. Besides the three guiding questions the following main research question will be addressed in this project:

- How does the CREMA mechanism address the issue of deforestation in the cocoa production in the Nawa region in Côte d'Ivoire and what are the challenges in implementation?
- What is the effectiveness of agroforestry and PES practices promoted by the CREMA mechanism in improving the sustainability of small-scale cocoa production?

2. Methodology

2.1 Data collection

Scientific papers and reports were searched by using key words and boolean operators (AND, OR). For finding evidence on certification schemes key words such as "certificates/ion", "voluntarily standards" were linked with (AND) Côte d'Ivoire or Ivory Coast. Scientific Papers focusing on agroforestry were searched by using words such as "agroforestry", "sustainable cocoa production", or "climate-friendly cocoa". Regarding the CREMA mechanism, the search was mainly focused on Ghana, since there are no scientific articles investigating the approach in Côte d'Ivoire. Articles prior to 2013 were ignored, as only the more recent scientific studies and results should be included in the analysis. Prior to collecting the studies, the methodology was screened to only select papers with clearly stated empirical findings. Due to the small fraction of suitable case studies, articles such as Tscharntke et al., 2015, focusing on several case studies was also selected as an adequate primary source. All in all, 11 papers were selected for further analysis.

2.2 Data preparation

Before analyzing the papers and their findings the abstract was read to either accept or discard the paper. Once chosen, the results and conclusion chapters were read. Subsequently key notes were taken, and where possible the significance or confidence of a certain effect or intervention were also marked. As the findings flow directly into the theory of change (ToC), their significance matters to illustrate confident results (dashed arrows, color).

2.3 Data analysis

Since the primary sources and their key results serve as data for creating the ToCs, coding and a further analysis does not make sense, especially due to the small and heterogeneous data (only 11 primary studies). Key findings are directly put into the ToC. Dashed arrows represent uncertain results with too less evidence. The width of the arrow represents the confidence, thus the bigger the arrow, the more evidence (several studies come to the same conclusion/statistically significant data). After analyzing the 11 scientific papers a final, synthesized theory of change was constructed to integrate all the chosen intervention types.

2.4 Theory of Change

To evaluate the literature the theory of change is applied. Three spheres make up the whole process of change. All activities and direct outcomes of an intervention are in the sphere of control, whereas outcomes beyond the intervention's control remain in the sphere of influence. As a last part, the sphere of interest represents structural change (long-term) (Belcher et al., 2019). The introduced theory of change in the results section (see chapter 3) does include these three spheres. It is difficult to define whether certain outcomes are under control, therefore the interface between the sphere of control and influence represents an important area. Additionally, key factors or conditions are marked as red, to reaffirm their relevance for the success.

2.5 Expert interview

An interview with Ariane Amin from the Centre Suisse de Recherche Scientifique (CSRS) was conducted on the 30.01.2023 at 10:00 a.m. (GMT) to validate the findings of the literature review. For 30 minutes a discussion regarding certification, agroforestry and sustainable cocoa was held. Notes were taken for evaluating the literature data.

3. Results

In this chapter the findings of the literature review are presented. Furthermore, the initial ToCs as well as the final ToC are displayed. After introducing the three ToCs the synthesized form is shortly presented, and its key synergies / trade-offs debated.

3.1 ToC Agroforestry

First, agroforestry as a system is understood as the production of cocoa while maintaining trees on their plantations, combining other type of fruits with cocoa. Since agroforestry adoptions are promoted by voluntary standard programmes such as UTZ or Rainforest Alliance, the sphere of control integrates some activities related to these (training, workshop, knowledge co-generation).

Agroforestry and its promises and potential are primarily positively described in the literature. Due to the adoption of trees on the cocoa plantation, yields tend to decrease, compared to monocultures. However, these short-term deficits do extend the productivity in the long-term (Niether et al., 2020). Awareness spreading constitutes an important part in the activities, since the benefits as well as the long-term thinking must be embedded to promote agroforestry in the cocoa production. Shade trees on cocoa farms is a direct outcome of the increased awareness. A variety of benefits do stem from awareness spreading and knowledge co-generation, such as better local climactic conditions, better access to an energy source (wood of trees), or a higher sequestration of carbon. In general, the direct outcomes do rely on land and tree tenure security. Tenure uncertainties were mentioned in all analyzed papers and therefore constitute preconditions for a functioning cocoa-agroforestry system. Within the sphere of interest, the outputs of the intervention result in different long-term outcomes. Tree diversity and its impact on income and ultimately food security is heavily debated. Whereas Niether et al., (2020) do not find any evidence on higher incomes (dashed lines) through agroforestry, Kouassi et al., (2021 b) describe diversifying through local and exotic fruits as key for ensuring food security. Further, the need for market access represents a prerequisite. According to Kouassi et al., (2021) payments for ecosystem services (PES) could provide financial incentives to adopt agroforestry and enhance tree diversity. Numerous outcomes linked to climate change adaption / mitigation stem from shade trees on the farms. Besides, wood as energy source ultimately improves the livelihood, especially for women. Collecting firewood in forests is often accompanied by long, exhausting walks to forests. Since wood can be harvested on-farm, this represents an important step towards more gender equality in cocoa production (Kouassi et al., 2021 b). training on good agricultural practices, also via workshops for fertilizer application a more sustainable way of farming is achieved. Based on the findings of Niether et al., (2020) good practices are one of a few ways to ensure good economic returns. The ecological benefits of agroforestry mainly encompass climate mitigation and adaption. These in turn also stand as long-term requirements for climate-friendly, deforestation-free & sustainable cocoa. Whether agroforestry inherently changes deforestation and land degradation patterns cannot be fully supported, since there is mixed evidence regarding resilient livelihoods and increased incomes. Biodiversity conservation is positively impacted. According to Smith Dumont et al., (2014) agroforest systems contain endangered tree species and represent last refugia for native species. In addition, promoting appropriate tree diversity via collaboration between different stakeholders (farmers, scientists etc.) significantly benefits biodiversity conservation.

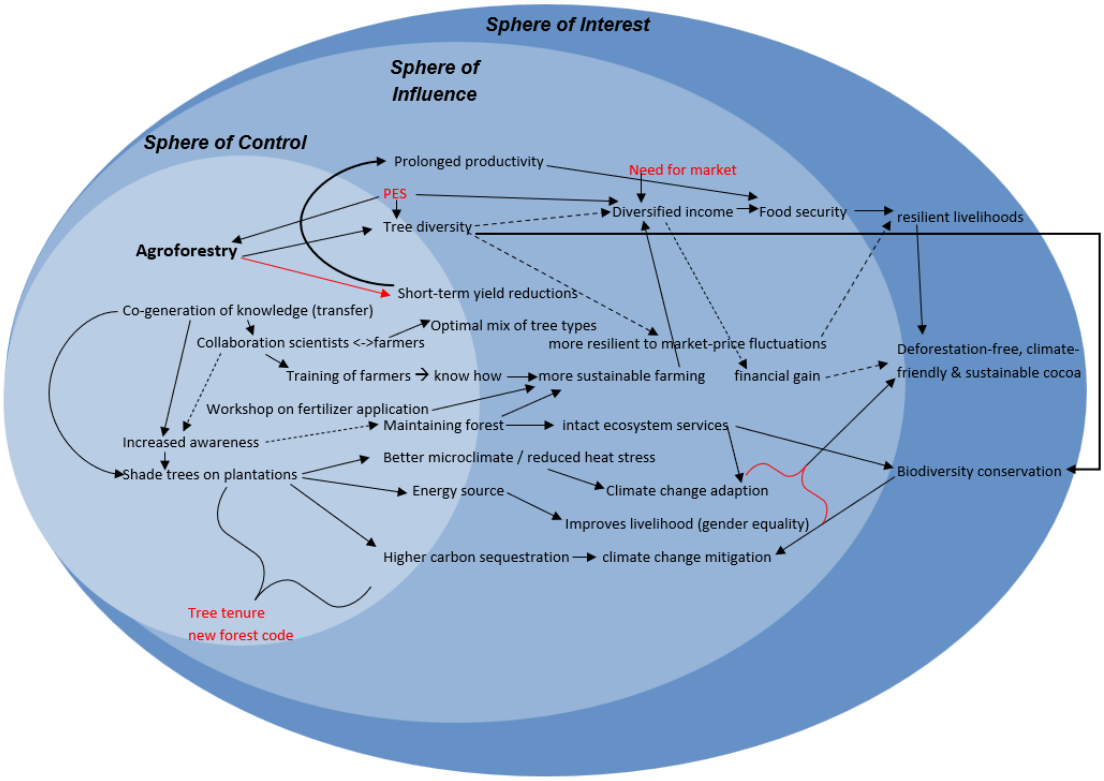

Figure 1: ToC for Agroforestry. Own design, adapted by Belcher et al., 2019.

3.2 ToC Certification

As introduced in the introduction part (see chapter 1) of this paper, voluntary standards, such as certificate programs play a vital role in cocoa production. Therefore, certification represents an essential component of the proposed interventions for the Nawa region in Côte d'Ivoire.

Certifications are characterized through various trainings and workshops mainly guided towards enhanced productivity. Increases in yields, and an enhanced productivity over time are observed (Ingram et al., 2018 / Knößlsdorfer, J. Sellare, M. Qaim, 2021 / Iddrisu, Aidoo, Wongnaa, 2020). Increased productivity accompanied by larger prices for cocoa result in higher incomes compared to non-certified famers. Knößlsdorfer, J. Sellare, M. Qaim, 2021 propose provision of inputs and specific training as the most efficient measure. Moreover, training on "good sustainable practices" lead to improved ecological properties, such as soil and water quality. Agroforestry can also be linked to certification. Tscharntke et al. (2015) propose to go beyond certifying cocoa and instead focus on the landscape as a certification unit. There is a need for locally adapting standards and guidelines for sustainable cocoa production, especially for major global certificates. Context specific guidelines, for example species richness, could also result in higher up-take of agroforestry and establish more sustainable production. Payments for carbon storage or guaranteeing a high degree of genetic biodiversity would further provide incentives to farmers and in tun positively influence certification.

Since higher yields and prices for cocoa are positively affected by certification, incomes tend to be greater for certified households. Further improved by the various services coming from certification, and therefore enhanced productivity. However, food security seems to be negatively affected by certifications. According to Knößlsdorfer, J. Sellare & M. Qaim (2021) revenues from cocoa only arrive twice a year, which commonly is used for non-food purchases. Iddrisu, Aidoo & Wongnaa (2020) indicate that the additional income due to certification is too low to compensate for certification requirement costs and food purchases. Spillover effects on non-certified farmers represents an unintended impact in the case study conducted by Ingram et al., (2018). Finally, outcomes on child labor and school attendance are rather marginal. Despite lowering child labor on farms there still is a knowledge gap regarding child labor laws. Knößlsdorfer, J. Sellare & M. Qaim (2021) come to similar findings, and further elaborate that child labor decreases only appear in households above a certain income minimum.

Since the analyzed case studies only reveal modest benefits linked to certification schemes, the overall effect on structural change is assumed to be low. Certification and its associated services only marginally improve the resilience of smallholders. Resilience especially to climate change is lacking in the whole sector (Ingram et al., 2018). As mentioned above, going beyond certifying only cocoa could potentially reduce vulnerabilities to socio-economic and ecological disturbances. Concerning deforestation, only one study (Tscharntke et al., 2015) suggested that certified agroforestry farmers are less likely to engage in deforestation activities than non-certified farmers. Long-term impacts on biodiversity conservation are more emphasized. Landscape certification and PES could lead to more sustainable cocoa production, and potentially also positively impact livelihoods. Due to limited available data and few empirical findings, only the positive effect on biodiversity conservation is pronounced in the theory of change, whereas effects on livelihoods and deforestation free, sustainable, and climate-friendly cocoa are accompanied by a high degree of uncertainty.

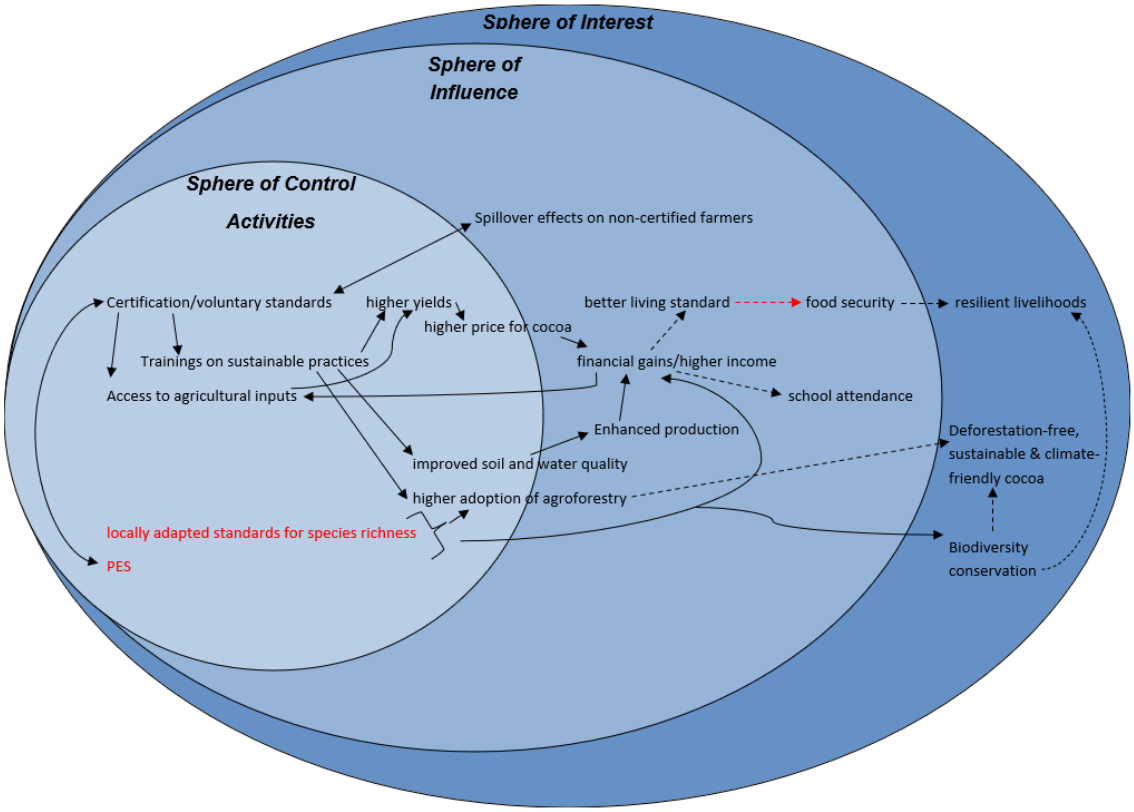

Figure 2: ToC for certification. Own design, adapted by Belcher et al., 2019.

3.3 ToC CREMA

As a third ToC the community resource management area (CREMA) mechanism is proposed to improve the sustainability of cocoa production in Côte d'Ivoire. A short introduction is given in chapter 1. Traceability issues are common among the cocoa supply chain. Especially in protected forests, efficient monitoring via remote sensing is almost impossible due to the tree canopies. Peer-check systems could reduce these issues and simultaneously establish a more inclusive system, supported by community-based reporting (Maguire-Rajpaul et al., 2022 / Asare, Kyei & Mason, 2013). Furthermore, through the authority given by the local government the formalization of rules and guidelines are also backed by the legislation. Through a participatory multi stakeholder process rules are made in a way, that all views and concerns are addressed and considered. All in all, CREMA could lead to a less invasive monitoring. Another strength of the concept is "farmer-to-farmer" learning and the integration of local knowledge into the design of the actual landscape governance (Maguire-Rajpaul et al., 2022). Also, the CREMA approach from Ghana is often linked with climate smart cocoa (CSC). Nasser et al. (2020) mentioned an opportunity to implement CSC on the land scape with the help of the CREMA approach to support the voice of farmers. However, implementing a CREMA project does require a sound financial plan. Case studies (Nasser et al., 2020) have shown, that the financial sustainability of this mechanism remains weak. Often implemented projects, especially at the beginning are dependent on outside donors and funds. In this instance transnational cooperations could be involved to ensure a long-lasting project. Asare, Kyei & Mason (2013) also indicate collaborations with initiatives such as REDD+ or other institutions regarding carbon

payments as an additional source of revenue. In Ghana the forestry commission endorsed the use of the CREMA mechanism for REDD+ implementations on the landscape level. Since CREMAs are sanctioned by the government and have their support they represent suitable projects for REDD+ or other initiatives.

Since governments grant the authority over natural resources in the landscape to CREMA there seems to be a loophole regarding tenure. Accordingly, all the land and trees within the CREMA boundary are owned by the members. Selling timber from cocoa farms could for example add another revenue stream to the farmers, by diversifying their income and ultimately improving their livelihoods (Asare, Kyei & Mason, 2013 / Nasser et al., 2020). Through establishing CREMAs, the tenure issue is also pushed up the agenda and might push the government to introduce new policies (Maguire-Rajpaul et al., 2022). Regarding livelihoods, there are multiple factors enabling a more resilient outcome. Social cohesion mentioned by two of the three case studies represents an important driver. Through democratic decision-making the project itself is strengthened due to more social cohesion which enables a long-lasting project and attracts organizations to get involved in CREMA. That said, biodiversity conservation, as other ecosystem services could be embedded in CREMA via other initiatives such as REDD+ (Asare Kyei & Mason, 2013).

Despite proposing CREMA as an adequate tool for more sustainable cocoa in the Nawa region and its added benefits, several issues and challenges remain. Firstly, implementing a CREMA is quite enduring and paired to a lot of assumptions, such as government's willingness, participation of local farmers, support of non-governmental organizations or transnational incorporations. Secondly, CREMA is currently only used in Ghana and how well this mechanism is adaptable for Côte d'Ivoire remains unknown. Further implication of CREMA and its possibilities are presented in the discussion (see chapter 4).

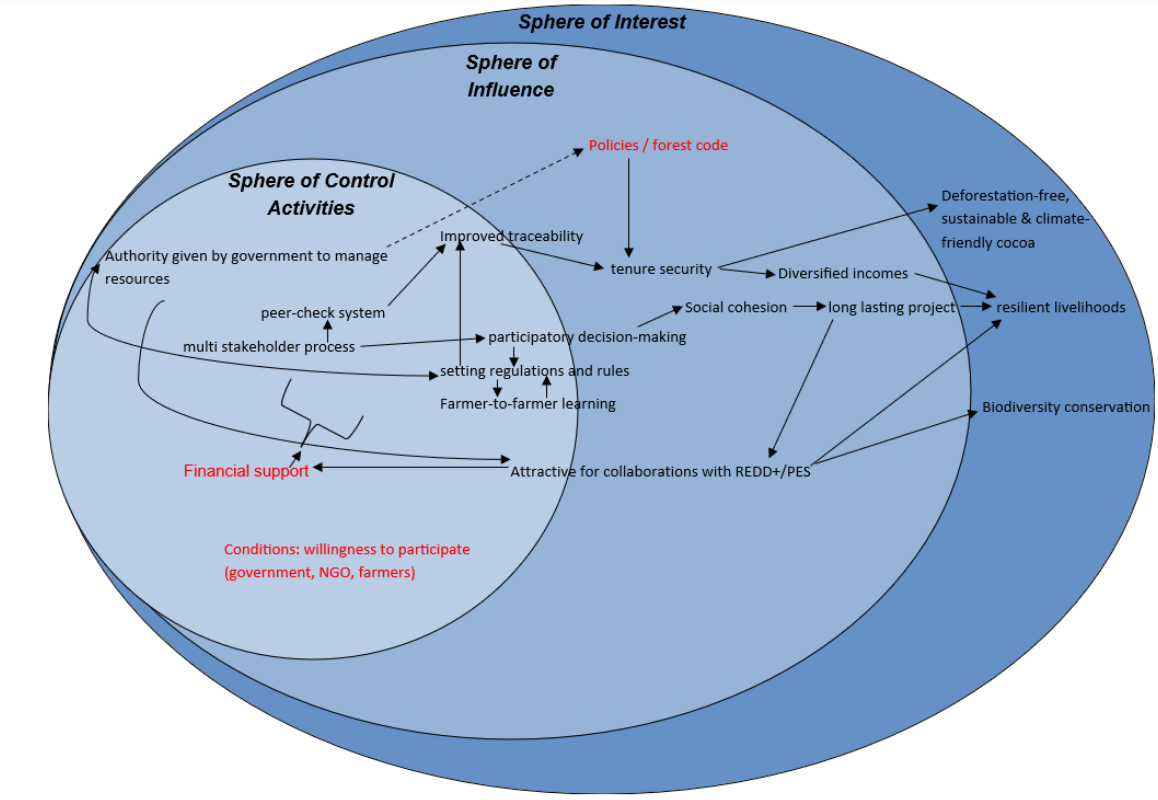

Figure 3: ToC for CREMA. Own design, adapted by Belcher et al., 2019.

3.4 Synthesized ToC

Since CREMA represent a landscape level tool the certification and agroforestry are integrated into the proposed mechanism. Agroforestry and certification can be well linked to on the one hand establish a revenue stream and on the other hand promote a sustainable, deforestation-free, and climate-friendly cocoa production.

First, multistakeholder approach guarantee a high degree of participation and generate a collaboration between farmers and other stakeholders. Within this participatory process stringent rules are made. Furthermore, principles on sustainable practices related to agroforestry are debated, to improve the sustainability of cocoa and create the necessary standards for certification to enhance the income of farmers. Through the CREMA tenure uncertainties are reduced, which in tun strengthens the adoption of agroforestry and indirectly other income sources such as PES or REDD+. Also, secured tenure promotes shade trees on cocoa plantations which further facilitates agroforestry. Since certification is coherent with the participative established guidelines on sustainable cocoa, ecosystems and their protection must be adhered to (named as ecological sustainability in ToC). Peer-checks improve the traceability, which further strengthens certification, guaranteeing farmers their income. Due to different income streams, agroforestry with a high degree of diversity can be established since farmers don't solely rely on cocoa. Thus, farmers can increase their resilience for market collapses or climate change. Higher incomes and diversified revenue streams improve food security and provides better livelihoods for the smallholders. Along livelihood resilience, farmers must adhere to the guidelines and deforestation is minimized (within the boundary of CREMA!). This includes biodiversity conservation which is also incentivized through PES/REDD+.

The proposed interventions display only positive outcomes and long-term impacts. Of course, there are several factors undermining these proposed interventions. One of the main issues regarding the interventions is the financial outcome for farmers. Case studies regarding agroforestry and certifications (See chapter 3.1 / 3.2) revealed modest findings related to increased incomes. Additionally, CREMA projects in Ghana often fail due to low financial capital. Combining different revenue streams could potentially increase the often cited "modest benefits". The tenure issues related to cocoa production also could hinder the effect of the linked interventions. According to Ariane Amin (Personal communication, 2023), agroforestry adoption is often low due to long growth periods of trees. Similarly, to the short-term decreases in yield, long-term effects are often not priority. Since growing trees on plantations decreases the surface of the farm where cocoa can be grown, yields decrease. PES could provide an alternative, because compensations for growing trees could help farmers compensate for the growing period of trees. Another important point not considered in the synthesized ToC are migrating farmers. Obtaining any sort of land title for migrants is almost impossible. Migrating into protected forests ultimately poses as only alternative to cultivate cocoa for migrants, because the management costs are lower. Further considerations and general challenges and research gaps are presented in the discussion (chapter 4).

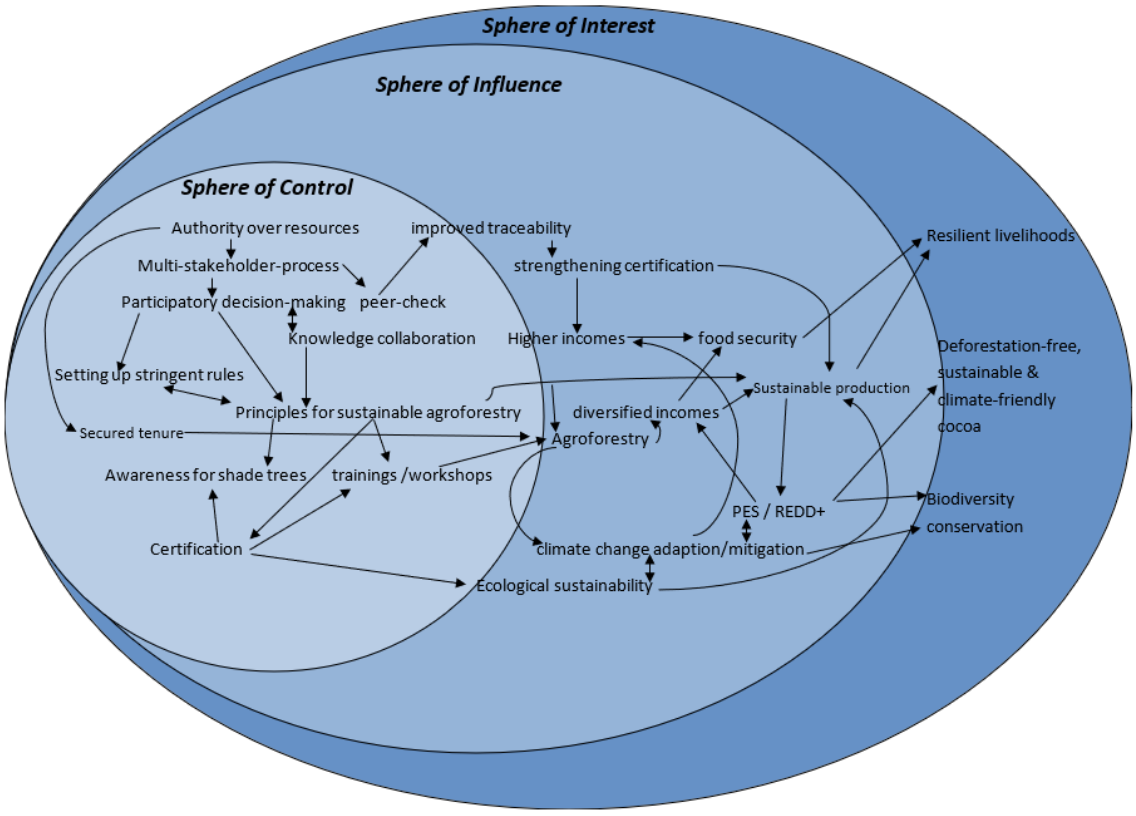

Figure 4: synthesized ToC. Own design, adapted by Belcher et al., 2019.

4. Discussion

In the southwest of Côte d'Ivoire cocoa production is booming. The national parc Taï in the Nawa region additionally emphasizes the need for structural change. Therefore, CREMA provides a useful tool for really halting deforestation. However, according to Ruf & Varlet (2017) cocoa-induced deforestation seems to continue. They give a grim outlook on deforestation and indicate that deforestation-free cocoa is only possible, provided that all forests are cleared. Certification and other initiatives launched by multi-national firms only incrementally make a difference. Compared to the selected case studies, certification does not seem to work as it is intended. Empirical evidence remains small.

The following research questions were made at the start of the seminar:

- How does the CREMA mechanism address the issue of deforestation in the cocoa production in the Nawa region in Côte d'Ivoire and what are the challenges in implementation?
- What is the effectiveness of agroforestry and PES practices promoted by the CREMA mechanism in improving the sustainability of small-scale cocoa production?

Since CREMA provides a tool for overcoming tenure issues, deforestation pressures around the Taï national parc could be reduced. The ToC has shown that in combination with certification, PES and a sustainable managed agroforestry can lead to a more sustainable system. However, certain conditions significantly challenge the proposed success. The CREMA mechanism is absent in Côte d'Ivoire. There isn't any literature indicating the adoption of this tool. Moreover, Côte d'Ivoire and Ghana have different histories, regarding colonization, independence, and cocoa production. Disputes and tensions between migrant cocoa farmers and native farmers are present until today. Multinational initiatives often neglect and simply overlook ethnic context and local conditions (Maguire-Rajpaul et al., 2022). Despite offering the opportunity to impact the cocoa production at the landscape level the financial capital needed for such an approach is indeed a challenge. In Ghana governments appear to promote the tool and consider implementing REDD+ and other carbon sequestration projects jointly with CREMA. Regarding the Nawa region surrounding the Taï national parc CREMA seems promising as case studies from Ghana indicated that the mechanism is suitable for areas around protected areas.

Concerning the second research question, the joint intervention of agroforestry and CREMA could benefit smallholders in terms of diversifying their income and improving their resilience towards disturbances. Agroforestry adoption remains rather low. This can partly be explained by the historical promotion of cocoa monocultures without trees (Smith Dumont et al.,2014). The cases studies suggest that awareness spreading of the benefits of trees, especially the feed-back loop of lower yields in the short-term and long-term productivity, are needed. Also, the newly established forest code is not widespread and lacking knowledge about tenure is hindering the adoption. Combining agroforestry with PES could promote more tree density and diversity. However, whether the additional revenues coming from protecting ecosystem services would provide enough incentives to scale up at the landscape level is questionable. Designing the CREMA to provide enough financial incentives to compete with monocultural yields in cocoa production will be a challenge.

Going beyond certification does represent a key result of this seminar paper. Case studies and the rather low effects in the ToC reveal the marginal benefits associated with certification / voluntary standards. Unintended impacts such as spillover effects analyzed by Ingram and colleagues (2018) indicate the minimal impacts of certification. Over the years NGOs and other institutions provide trainings and workshops free of charge which eventually amount to same prices and yields as certified farmers. The authors also suggest that certified farmers have reached a limit in their production. While the incremental effect of voluntary standards is acknowledged by various stakeholders (academia, civil society organizations, and farmers) the private sector still insists on using and promoting certifications. As depicted in the theory of change voluntary standards alone cannot really improve the resilience of smallholders and the need for a structural transformation of the whole cocoa production system is indeed necessary. Moreover Tscharntke et al. (2015) debated whether more stringent socio-ecological standards could be more beneficial. More stringent standards would probably lead to higher production costs without compensating these, less farmers would have enough incentives to participate. Further, the authors debate around certifying the landscape instead of only cocoa. Undertaking such an effort at the landscape level could be connected to CREMA.

The interview conducted with Ariane Amin confirmed some of the key findings especially regarding the need for systems such as payments for ecosystem services (PES). She mentioned a promising approach towards PES in the southeast of Côte d'Ivoire, where the mechanism was implemented 2-3 years ago. Further, she acknowledged the need for more structural change, as there are many initiatives present in the country, but only limited improvements are observed. Concerning the effect of certification, she referred to the fragmented distribution of smallholders. Farmers with only a few ha agricultural land can only marginally improve their incomes through certifications. Giving the farmers more say in the production would possibly lead to more change. According to her, diversifying within an agroforestry system does not result in significant income. Finally, collaboration with academia and farmers is needed to find out which trees should be planted in agroforestry systems. Trees with a smaller growing period should be preferred in order to minimize lost yields.

The proposed ToCs for improving current cocoa production in the Nawa region rely on theoretical and empirical findings. Since only eleven documents were selected for analysis and finally creating the ToCs only a handful of current scientific knowledge and practical insights from case studies are incorporated. Accordingly, uncertainties are displayed for the singular ToCs (dashed liens, red color). No conclusion can be drawn, whether there are trade-offs involved in combining these three interventions.

Research gaps remain surrounding sustainable cocoa production. Considering the variety of different voluntary standards and their involvement in the last decades, the actual benefits and improvements of these mechanisms remain uncertain. Within this paper the effectiveness of certifications was questioned and based on the available data these initiatives do not work towards sustainable cocoa, a decent living income or deforestation- free cocoa but merely as tools to enhance productivity. Further, CREMA is a relatively unknown mechanism limited to Ghana, therefore research addressing this mechanism in the context of Côte d'Ivoire is necessary.

5. Conclusion

This research paper examined the use of three different intervention types to promote a more sustainable cocoa production in the south-west of Côte d'Ivoire. Agroforestry particularly with the adoption of the landscape level mechanism CREMA proved to be a possible solution to large-scale deforestation and poor economic performance of current small-scale cocoa production. Achieving higher yields and incomes alone does not really alter the current farmer's livelihoods. Establishing a CREMA around the Nawa region could benefit in more ways, for example providing a voice to the farmers, designing sound ecologically, economically, and socially justified principles of conduct. Regarding income, collaborations with certifications or preferably REDD+ or PES could provide the necessary means to move past the poverty line. Another vital point is the participatory approach where all farmers are incorporated across the landscape. These provided arguments comply to assumptions based on the available literature and therefore also imply certain conditions, such as tenure security, the trust and support of the government, and the acceptance and willingness of famers to participate in this mechanism. This approach is tailored towards the Nawa region next to the Taï national park containing some of the last intact biomes in West-Africa. Hence biodiversity conservation is also emphasized in the theory of change alongside halting deforestation. The presented implications of combining the CREMA mechanism with agroforestry and certification reveal an interesting starting point for structural change on how cocoa could be produced in the Nawa region in Côte d'Ivoire.

6. Bibliography

Asare, R. A., Kyei, A., & Mason, J. J. (2013). The community resource management area mechanism: A strategy to manage african forest resources for REDD+. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *368*(1625). https://doi.org/10.1098/rstb.2012.0311

Baruah, M., Bobtoya, S., Mbile, P., & Walters, G. (2016). Governance of restoration and institutions: Working with Ghana's Community Resource Management Areas. *World Development Perspectives*, *3*, 38–41. https://doi.org/10.1016/j.wdp.2016.11.008

Belcher, B. M., Claus, R., Davel, R., & Ramirez, L. F. (2019). Linking transdisciplinary research characteristics and quality to effectiveness: A comparative analysis of five research-for-development projects. *Environmental Science and Policy*, *101*, 192–203. https://doi.org/10.1016/j.envsci.2019.08.013

Carodenuto, S., & Buluran, M. (2021). The effect of supply chain position on zero-deforestation commitments: evidence from the cocoa industry. *Journal of Environmental Policy and Planning*, *23*(6), 716–731. https://doi.org/10.1080/1523908X.2021.1910020

EUREDD. (2023). Côte d'Ivoire. https://euredd.efi.int/countries/Côte-Ivoire/ (accessed: 04.01.2023)

Iddrisu, M., Aidoo, R., & Abawiera Wongnaa, C. (2020). Participation in UTZ-RA voluntary cocoa certification scheme and its impact on smallholder welfare: Evidence from Ghana. *World Development Perspectives*, *20*. https://doi.org/10.1016/j.wdp.2020.100244

Ingram, V., van Rijn, F., Waarts, Y., & Gilhuis, H. (2018). The impacts of cocoa sustainability initiatives in West Africa. *Sustainability (Switzerland)*, *10*(11). https://doi.org/10.3390/su10114249

Knößlsdorfer, I., Sellare, J., & Qaim, M. (2021). Effects of Fairtrade on farm household food security and living standards: Insights from Côte d'Ivoire. *Global Food Security*, *29*. https://doi.org/10.1016/j.gfs.2021.100535

Kouassi, J. L., Gyau, A., Diby, L., Bene, Y., & Kouamé, C. (2021) b. Assessing land use and land cover change and farmers' perceptions of deforestation and land degradation in south-west Côte d'Ivoire,West Africa. *Land*, *10*(4). https://doi.org/10.3390/land10040429

Kouassi, J. L., Kouassi, A., Bene, Y., Konan, D., Tondoh, E. J., & Kouame, C. (2021). Exploring barriers to agroforestry adoption by cocoa farmers in south-western Côte d'Ivoire. *Sustainability (Switzerland)*, *13*(23). https://doi.org/10.3390/su132313075

Maguire-Rajpaul, V. A., Sandbrook, C., McDermott, C., & Hirons, M. A. (2022). Climate-smart cocoa governance risks entrenching old hegemonies in Côte d'Ivoire and Ghana: a multiple environmentality analysis. *Geoforum*, *130*, 78–91. https://doi.org/10.1016/j.geoforum.2021.09.015

Nasser, F., Maguire-Rajpaul, V. A., Dumenu, W. K., & Wong, G. Y. (2020). Climate-Smart Cocoa in Ghana: How Ecological Modernisation Discourse Risks Side-Lining Cocoa Smallholders. *Frontiers in Sustainable Food Systems*, *4*. https://doi.org/10.3389/fsufs.2020.00073

Niether, W., Jacobi, J., Blaser, W. J., Andres, C., & Armengot, L. (2020). Cocoa agroforestry systems versus monocultures: A multi-dimensional meta-analysis. *Environmental Research Letters*, *15*(10). https://doi.org/10.1088/1748-9326/abb053

Ongolo, S., Kouassi, S. K., Chérif, S., & Giessen, L. (2018). The tragedy of forestland sustainability in postcolonial Africa: Land development, Cocoa, and politics in Côte d'Ivoire. *Sustainability (Switzerland)*, *10*(12). https://doi.org/10.3390/su10124611

Ruf, F., & Varlet, F. (2017). 3.3 The myth of zero deforestation in Côte d'Ivoire. *ETFRN* News 58. 86-92.

Sabas, B. Y. S., Danmo, K. G., Madeleine, K. A. T., & Jan, B. (2020). Cocoa production and forest dynamics in Ivory Coast from 1985 to 2019. *Land*, *9*(12), 1–22. https://doi.org/10.3390/land9120524

Smith Dumont, E., Gnahoua, G. M., Ohouo, L., Sinclair, F. L., & Vaast, P. (2014). Farmers in Côte d'Ivoire value integrating tree diversity in cocoa for the provision of ecosystem services. *Agroforestry Systems*, *88*(6), 1047–1066. https://doi.org/10.1007/s10457-014-9679-4

Tscharntke, T., Milder, J. C., Schroth, G., Clough, Y., Declerck, F., Waldron, A., Rice, R., & Ghazoul, J. (2015). Conserving Biodiversity Through Certification of Tropical Agroforestry Crops at Local and Landscape Scales. *Conservation Letters*,*8*(1), 14–23. https://doi.org/10.1111/conl.12110

Vaast, P., & Somarriba, E. (2014). Trade-offs between crop intensification and ecosystem services: the role of agroforestry in cocoa cultivation. *Agroforestry Systems*,*88*(6), 947–956. Kluwer Academic Publishers. https://doi.org/10.1007/s10457-014-9762-x

Vervuurt, W., Slingerland, M. A., Pronk, A. A., & van Bussel, L. G. J. (2022). Modelling greenhouse gas emissions of cacao production in the Republic of Côte d'Ivoire. *Agroforestry Systems*, *96*(2), 417–434. https://doi.org/10.1007/s10457-022-00729-8