SUSTAINABLE SUPPLY CHAIN MANAGEMENT WITHIN THE CONTEXT OF THE EUDR AND COCOA IN GHANA

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Abstract

The European Union Deforestation Regulation (EUDR) represents a fundamental shift in how sustainability is governed within global agricultural supply chains. Moving beyond voluntary certification, the regulation introduces legally binding requirements for deforestation-free production, traceability, and due diligence.

This paper examines the implications of the EUDR for Ghana's cocoa sector, a globally significant producer facing persistent challenges related to deforestation, farmer poverty, and fragmented traceability systems.

Drawing on Ghana's institutional structure and ongoing implementation efforts, the paper analyses how the EUDR is reshaping supply chain governance, digital infrastructure, and stakeholder coordination.

Particular attention is given to the Cocoa Management System (CMS) as a national response to traceability requirements, as well as the social and economic realities that influence farmer compliance.

The paper argues that while the EUDR introduces substantial technical and operational challenges, it also creates an opportunity for systemic transformation. By strengthening forest governance, improving data systems, and aligning sustainability with market access, Ghana can reposition itself as a credible model for sustainable cocoa production.

However, long-term success depends on addressing underlying issues of farmer livelihoods, institutional capacity and inclusive implementation.

1.0 Introduction

The global cocoa industry is no longer operating in familiar territory. For years, cocoa has been sold to the world as a simple pleasure and an indulgence with little thought given to its origins. But that narrative has steadily unravelled. Behind the chocolate bar lies a set of persistent and uncomfortable realities: deforestation, labour concerns, climate stress, and chronic farmer poverty (**Gockowski & Sonwa, 2011; Ruf & Bini, 2021**). These are not abstract sustainability debates. They are lived experiences in cocoa growing communities, particularly across West Africa.

Ghana occupies a central place in this reality. As the world's second-largest cocoa producer, the country has built its reputation on quality, consistency, and institutional control (**Vigneri & Kolavalli, 2018**). Ghanaian cocoa enjoys preferential access to premium markets, especially in Europe. Yet that same positioning now brings heightened scrutiny. Expectations around environmental responsibility, traceability, and legality have hardened, and they are increasingly being enforced through regulation rather than persuasion.

The European Union Deforestation Regulation (EUDR), introduced in 2023, represents a decisive break from the past (**European Commission, 2023**). Unlike voluntary certification schemes, the EUDR is a binding legal instrument. It requires cocoa entering the European market to be demonstrably deforestation-free and legally produced, supported by precise geolocation data at farm level. Compliance is no longer a branding exercise; it is a condition for market access.

It is worth stating upfront that much of the discussion around the EUDR tends to be abstract. From the perspective of implementation, however, the regulation quickly becomes very concrete. It shows up in questions from farmers who want to know whether their cocoa will still be bought, in the concerns of buying companies unsure how much documentation will be considered sufficient, and in the practical limits of systems that must function in rural areas with weak connectivity. These realities shape how sustainability is understood in practice, not as an ideal, but as something that must work under imperfect conditions.

This paper examines what sustainable supply chain management means for Ghana's cocoa sector under these new conditions. It looks at how the EUDR is reshaping governance, digital infrastructure, institutional coordination, and farmer engagement in practice. The central argument is that although the EUDR introduces serious technical, social, and economic challenges, it also presents Ghana with a rare opportunity to modernise its cocoa systems, strengthen forest governance, and build a more credible and resilient supply chain.

This paper is guided by the following research question: How is the European Union Deforestation Regulation (EUDR) reshaping sustainable supply chain management in Ghana's cocoa sector, and what opportunities and challenges does this create for governance, technology, and farmer livelihoods?

2.0 Ghana's Cocoa Sector: How the System Really Works

Ghana's cocoa sector is organised around a highly centralised institutional structure. The Ghana Cocoa Board (COCOBOD) oversees quality control, research, extension services, pricing mechanisms, and export marketing (**Kolavalli & Vigneri, 2017**). This system has delivered tangible benefits, particularly Ghana's long-standing reputation for high-quality cocoa and price stability for farmers.

However, these strengths coexist with deep structural weaknesses. Productivity remains low, driven by aging tree stock and limited farm rehabilitation (**Asare et al., 2022**). Diseases such as cocoa swollen shoot virus continue to affect yields, while land tenure arrangements in many cocoa-growing areas remain informal or contested. Climate variability has further complicated production, disrupting rainfall patterns and increasing vulnerability (**Ruf & Bini, 2021**).

These pressures shape farmer behaviour. When yields fall and incomes stagnate, expansion into new land often forested areas becomes a rational response. Any discussion of sustainability that ignores these economic realities risks misunderstanding the drivers of deforestation.

3.0 Sustainability Challenges Beneath the Surface

Discussions about sustainability in Ghana's cocoa sector often begin with deforestation, and for understandable reasons. Forest loss is visible, measurable, and politically salient. Yet focusing on deforestation alone risks missing the conditions that make it persistent. In many cocoa-growing areas, environmental degradation is not the result of deliberate disregard for the law, but the outcome of farmers responding to declining yields, rising costs, and limited alternatives. Cocoa expansion has contributed to forest loss, biodiversity decline, and carbon stock reduction (**Hirons, 2014; Gockowski & Sonwa, 2011**). While cocoa is not the sole driver of deforestation, its contribution is significant enough to attract regulatory attention.

Farmer poverty remains a less visible but equally critical issue. Most cocoa farmers operate smallholdings and earn incomes that are low and volatile (**Laven & Boomsma, 2012**). Limited access to credit, inputs, and extension services constrains their ability to invest in improved practices or long-term farm rehabilitation. Sustainability, in this context, is constrained not by lack of awareness but by lack of options.

Traceability has also posed long-standing challenges. Prior to the EUDR, traceability efforts were driven largely by private sector initiatives and certification schemes, resulting in fragmented and overlapping systems (**Kroeger et al., 2017**). Some farmers were mapped repeatedly, while others were excluded altogether. The EUDR has exposed the limits of this fragmented approach.

4.0 From Voluntary Sustainability to Mandatory Compliance

For much of the past two decades, sustainability in the cocoa sector has been framed as a voluntary commitment, largely driven by certification schemes and corporate responsibility initiatives. While these approaches have raised awareness and introduced improved practices, their overall impact has been uneven and often limited in addressing structural challenges such as deforestation and farmer poverty **(Beuchelt & Zeller, 2011).**

One of the central limitations of voluntary sustainability has been its reliance on incentives rather than enforcement. Certification schemes often operate in parallel, leading to duplication of effort, inconsistent standards, and uneven farmer inclusion. In many cases, farmers participate in multiple schemes without experiencing meaningful improvements in income or long-term productivity.

The EUDR represents a decisive departure from this model. Sustainability is no longer optional or market-driven; it is a legal requirement. Compliance is enforced through regulatory mechanisms, with clear consequences for non-compliance, including exclusion from the European market. For Ghana, where Europe remains the dominant export destination, this shift fundamentally alters the operating environment.

At the same time, the move toward mandatory compliance exposes existing weaknesses within the sector. Fragmented traceability systems, unclear land tenure arrangements, and limited enforcement capacity become critical bottlenecks under a regulatory regime. As a result, the EUDR does not simply introduce new requirements; it reveals underlying structural gaps that must be addressed for sustainable supply chain management to be effective.

For much of the past two decades, sustainability in cocoa was framed as a voluntary commitment. Certification schemes raised awareness but delivered mixed results on the ground (**Beuchelt & Zeller, 2011**). Structural issues such as deforestation and poverty persisted.

The EUDR marks a fundamental shift. Sustainability is no longer optional. Market access now depends on compliance with legally enforceable requirements (**European Commission, 2023**). For Ghana, where Europe remains the primary destination for cocoa exports, this change is existential.

What distinguishes the EUDR is its reliance on evidence rather than assurances. Precise farm-level geolocation, a fixed deforestation cut-off date of December 31, 2020, and a risk-based country classification system introduce unprecedented scrutiny.

5.0 Understanding the EUDR in Practical Terms

In practical terms, the EUDR requires mapping hundreds of thousands of smallholder farms using GPS-based polygon data. Cocoa purchases must be traceable to specific farms, and those farms must be verified as deforestation-free after the cut-off date (**European Commission, 2023**).

On the ground, this is complex. Farm mapping requires field officers to travel to remote communities, navigate disputed boundaries, and address informal tenure arrangements. Gender dynamics often surface, as women involved in cocoa farming may not be formally recognised as landholders (**Barrientos, 2014**). These social realities complicate what might otherwise appear to be a technical compliance exercise.

In practice, farm mapping rarely proceeds in straight lines. Boundaries that appear clear on satellite imagery may be disputed on the ground. Field officers often find themselves mediating between neighbours, relying on local witnesses, or navigating long-standing informal agreements that were never documented. In some cases, a single cocoa plot may have changed hands several times without formal records. These moments reveal that traceability is as much a social process as a technical one.

6.0 Ghana's Digital Response: The Cocoa Management System

Recognising these challenges, Ghana adopted a national traceability approach rather than relying solely on private systems. This strategy reduces duplication, ensures consistent data standards, and supports national oversight (COCOBOD, 2023).

The Cocoa Management System (CMS) integrates farmer registration, farm mapping, digital purchasing, and forest boundary verification. It supports EUDR compliance while also improving transparency and efficiency across the sector. Forest data from the Forestry Commission is integrated to identify overlaps with protected areas (**Government of Ghana, 2023**).

There is sometimes an assumption that once a national system exists, compliance naturally follows. Experience suggests otherwise. Systems reduce uncertainty, but they do not eliminate it. Data gaps, delayed updates, and human error remain part of daily operations. The value of the CMS lies less in its promise of perfection than in its ability to make problems visible and manageable over time.

The successful EUDR dry run with the Netherlands Competent Authority demonstrated the system's operational readiness (**COCOBOD, 2024**). Beyond technical validation, this exercise-built confidence among regulators and private sector actors.

7.0 Environmental Sustainability: Beyond Compliance

Forest protection matters not only for EUDR compliance but for Ghana's own environmental security. Forests regulate water systems, protect soils, and support biodiversity (**Rice & Greenberg, 2000**). Their loss increases vulnerability to floods, droughts, and declining agricultural productivity.

The EUDR's requirement for continuous monitoring aligns with advances in satellite-based forest monitoring (**Hansen et al., 2013; Cazzolla-Gatti et al., 2019**). However, technology must be complemented by enforcement capacity and institutional coordination.

Agroforestry and shade-grown cocoa systems offer promising alternatives. These systems enhance biodiversity, sequester carbon, and improve microclimates for cocoa production (**Rice & Greenberg, 2000**).

8.0 Social Sustainability: Farmers at the Centre

Farmer livelihoods remain the most difficult sustainability challenge. Studies consistently show that cocoa farmers earn well below living income benchmarks (**Laven & Boomsma, 2012**). This poverty undermines long-term sustainability and drives environmentally harmful coping strategies.

From an operational standpoint, this income constrains surface repeatedly. It appears when farmers delay replanting despite knowing their trees are no longer productive, when recommended shade trees are rejected because they offer no short-term returns, and when compliance requirements are viewed with suspicion rather than confidence. These reactions are not failures of awareness; they are signals of economic stress.

While Ghana's national approach reduces the direct cost burden of EUDR compliance on farmers, it does not resolve the income challenge. Sustainable cocoa ultimately requires viable livelihoods.

Gender inclusion remains critical. Women contribute significantly to cocoa production but often lack land rights and access to services (**Barrientos, 2014**). Traceability systems can help address this if designed inclusively.

Although labour issues fall outside the EUDR's formal scope, improved traceability can support better monitoring of child labour and hazardous practices (**ILO, 2021**).

9.0 Governance, Institutions, and Coordination

EUDR implementation involves multiple institutions. COCOBOD manages the cocoa sector and traceability systems, while the Forestry Commission provides forest data and enforcement (**Government of Ghana, 2023**). Local authorities play essential roles in land-use governance.

Effective coordination remains challenging but essential. Data sharing, legal alignment, and institutional trust determine whether systems function or fragment. Legal clarity around land use and forest protection strengthens both EUDR compliance and national governance (**MLNR, 2022**).

10.0 Technology, Innovation, and Persistent Challenges

In addition to satellite-based monitoring, digital traceability systems such as Ghana's Cocoa Management System (CMS) integrate farmer registration, farm mapping, and transaction data. This creates a more coherent and standardised data environment compared to the previously fragmented landscape of private certification systems. By linking farm-level data to supply chain transactions, these systems improve transparency and accountability.

Despite these advances, technology alone cannot resolve the complexities of EUDR implementation. Data quality remains a persistent concern, particularly in contexts where farm boundaries are disputed or informally defined. Connectivity limitations in rural areas affect real-time data collection and system reliability. Moreover, the effective use of digital tools depends on human capacity, including the skills of field officers,

These challenges highlight the importance of viewing technology not as a standalone solution, but as part of a

broader socio-technical system. Investments in training, institutional coordination, and governance frameworks are essential to ensure that technological innovations translate into meaningful improvements in sustainability outcomes. Without these complementary efforts, there is a risk that digital systems may replicate existing inequalities or introduce new forms of exclusion.

Remote sensing and geospatial technologies underpin deforestation monitoring (Hansen et al., 2013). Blockchain solutions have attracted interest but remain limited in practical application (**Hackius & Petersen, 2017**).

Persistent challenges include data quality, enforcement capacity, and skills gaps across the value chain. Addressing these requires sustained investment in training and institutional capacity (**World Bank, 2020**).

11.0 Conclusion: Regulation as a Catalyst for Transformation

There is a temptation to frame the European Union Deforestation Regulation as either a threat to Ghana's cocoa sector or as a solution to its sustainability challenges. In reality, it is neither. The EUDR is a constraint one that exposes existing weaknesses, accelerates unresolved debates, and forces decisions that might otherwise have been deferred.

Ghana's response demonstrates both realism and ambition. Investments in national digital infrastructure, inter-agency coordination, and traceability systems provide a strong foundation. Significant challenges remain, but the trajectory is clear.

If Ghana succeeds, it can position itself as a credible global model for sustainable cocoa production, balancing environmental protection with economic and social realities. The EUDR, for all its demands, may ultimately serve as a catalyst for long overdue transformation.

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