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To cite this article: Dagmar Mithöfer, James M. Rossetko, Jason A. Donovan, Ewane Nathalie, Valentina Robiglio, Duman Wau, Denis J. Sonwa & Trent Blare (2017) Unpacking 'sustainable' cocoa: do sustainability standards, development projects and policies address producer concerns in Indonesia, Cameroon and Peru?, International Journal of Biodiversity Science, Ecosystem Services & Management, 13:1, 444-469, DOI: [10.1080/21513732.2018.1432691](https://doi.org/10.1080/21513732.2018.1432691)

To link to this article: <https://doi.org/10.1080/21513732.2018.1432691>



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Published online: 09 Feb 2018.



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Unpacking 'sustainable' cocoa: do sustainability standards, development projects and policies address producer concerns in Indonesia, Cameroon and Peru?

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ABSTRACT

'Sustainable cocoa' has attracted considerable attention. However, stakeholders in cocoa development may differ in their understanding of sustainable cocoa, their interests and actions taken in advancing sustainable cocoa. This article analyses cocoa sustainability at nested scales and analyses to what extent sustainability standards, policies and development projects address sustainability concerns and contribute to ecosystem services. The analysis is based on literature reviews and key informant interviews in Sulawesi (Indonesia), Ucayali (Peru) and Centre Region (Cameroon). Producers in all three countries shared concerns of price volatility, weak farmer organizations and dependence on few buyers. Producers in Sulawesi and Centre Region compensated low returns to cocoa production by diversification of cocoa systems. Public and private development actors were concerned with low production volumes. Research has so far focused on biodiversity loss, which differed depending on the cocoa sector's age in a country. Policies and development programs in all countries have focused on cocoa sector expansion and productivity increases, irrespective of smallholder needs for economically viable farming systems and existing market structures resulting in little bargaining power to farmers. Sustainability standards have spread unevenly and have converged in compliance criteria over time, although initially differing in focus. Recently added business and development criteria of sustainability standards can potentially address farmers' concerns. Competing interests and interdependencies between different actors' responses to concerns have so far not been openly acknowledged by public and private sector actors.

ARTICLE HISTORY

Received 7 April 2016
Accepted 18 January 2018

EDITED BY

Beria Leimona

KEYWORDS

Cocoa; sustainability standards; issue-attention cycle; swing potential; global value chain; development; policy

Introduction

Sustainability concerns for group of agricultural and forest products produced in the tropical countries, including coffee, oil palm, cocoa and timber, encompass important environmental, social and economic dimensions. Sustainability standards address some of these concerns and have the potential to contribute to development goals. The development of the cocoa sector in many tropical countries presents an important opportunity to advance social and economic goals, but also implies tradeoffs with environmental objectives and tensions among stakeholders, including smallholders, large-scale buyers and government agencies.

Cocoa (*Theobroma cacao* L.) production systems cover the gradient from shaded to sun-grown systems (Schroth et al. 2004; Tschardt et al. 2011) and are often established at the forest margin. Where cocoa is expanding, such expansion is intertwined with deforestation and the associated decline in the provision of ecosystem services. Cocoa production systems exhibit complex

interactions between productivity, shade and biodiversity (Zuidema et al. 2005; Wade et al. 2010; Deheuvels et al. 2012). Initially, monocultures produce more cocoa per area of land than shaded systems. However, monocultures have lower levels of biodiversity (Schroth and Harvey 2007), provide less ecosystem services (De Beenhouwer et al. 2013) and tend to have lower soil quality (Tondoh et al. 2015) and carbon stocks (Somarriba et al. 2013). Further, mixed agroforestry systems – particularly those integrating nitrogen-fixing or biomass accumulating species – can have lower input requirements and costs than monocultures, as the companion trees contribute organic matter which services as nitrogen-rich green manure (Roshetko 2001). The diverse species component of cocoa agroforestry systems provides flexible management options (Smiley and Kroschel 2008; Somarriba et al. 2013) and varied sources of income resulting in resilience of the system to fluctuating market and climatic conditions. Farmer-managers can limit the amount of biomass removed and soil tilled

Box 1. Description of case study countries and sites.*Sulawesi, Indonesia*

Cocoa has been an important commercial crop in Indonesia since the 1980s. The area under cocoa production is 1.5–1.7 million hectares, with smallholders managing 94% of the area (BPS 2010; DGE 2012). Based on total area under cultivation and average landholding, an estimated 2.2 million households cultivate cocoa (Janudianto et al. 2014). Sulawesi is the center of Indonesia's cocoa production, accounting for 67% of the yield (DGE 2012). Most farmers cultivate 0.5–2 ha of cocoa (Hafid and McKenzie 2012; Janudianto et al. 2012; Wau 2015). Cocoa production systems in Sulawesi include full-sun monoculture systems, shade cocoa systems and mixed cocoa systems. Cocoa-producing households earn 25–75% of their income from cocoa (Neilson et al. 2011; Janudianto et al. 2012; Khususiyah et al. 2012) (Table 2). The existing cocoa value chain in Sulawesi is characterized by farmgate sales. Farmers generally wait for collectors to arrive in the village. Collectors buy the beans and sell them to provincial traders, who may be agents for exporters or sell the beans to manufacturers (Perdana and Roshetko 2012). A large number of collectors and traders are engaged in the chain.

Central Region, Cameroon

In South and Central Cameroon, approximately 75% of the local population grows cocoa (Magne et al. 2014). Cocoa is mostly grown in agroforestry systems of varying species diversity (Sonwa et al. 2007) (Table 2). This case study draws on observations and data from two sites (Bokito and Ayos) in the Centre Region of Cameroon. Bokito is characterized by a degraded peri-urban forest landscape, where agroforestry-based cocoa systems are the mainstay for a large proportion of the inhabitants. Cocoa farms are more than 15 years old with production about to decline due to aging cocoa trees. The area is densely inhabited close to markets Cameroon's capital Yaoundé. This area is characterized by intensified agricultural and agroforestry production as well as large plantations with improved, structured production systems. Ayos is more remote and is characterized by gallery forests surrounded by swamp forests and cocoa-production systems of much lower intensity.

Ucayali, Peru

In Ucayali's Irazola district, the conversion of forest into agriculture has taken place over the last 60 years. Between 2001 and 2013, the surface of cocoa expanded mostly at the expense of old growth or secondary forest land. Cocoa farming households spread their labor over various on- and off-farm activities and an overall shortage of labor (household and hired) for cocoa plantations constrains area expansion. A sample of cocoa producers linked to the Irazola-based cocoa cooperative ACATPA showed that roughly 74% of total annual household income was derived from on-farm production and the remaining 26% from off-farm sources. About 80% of on-farm income was derived from cocoa production (Silva et al. 2015). Due to the relatively recent establishment of the cocoa crop, many farmers still exploit natural soil fertility to provide relatively high cocoa yields, at least in relative terms considering the age of the farm. Currently, less than half of cocoa farmer use any fertilizers (Silva et al. 2015) and productivity can be expected to decrease over time. External actors, mainly development projects, established many of Peru's cocoa cooperatives in an effort to facilitate the provision of technical assistance and inputs (e.g. planting material). Some cocoa buyers have partnered with NGOs to expand cocoa production and directly source cocoa. For example, several international cocoa buyers have partnered with NGOs to improve smallholder production and facilitate access to certification. In some cases, buyers have established local subsidiaries to source cocoa from cooperatives and have sometimes created farmers' associations managed by the buyer to capture the production of farmers not currently involved in cooperatives and to more directly control the quality of the product. The buyers have partnered with local NGOs to work directly with cooperatives, with the twofold purpose of meeting social responsibility goals demanded by the consumers and to increase productivity and formalize business operations. In promoting cocoa, the major focus of buyers has been on expanding areas and helping producers and their cooperatives meet quality expectations (Chesnoy 2015).

in these systems, reducing the loss of soil carbon and subsequent input requirements. These soil-carbon-conserving practices are possible with cocoa monocultures, but the intensive management linked to monocultures – frequent cleaning, weeding and use of chemicals – makes it less likely (Roshetko et al. 2007).

Additional to environmental concerns related to the loss of biodiversity, high concentration of grinders and manufacturers at the downstream end of the cocoa value chain raises economic and social concerns as concentration is associated with high control over the chain potentially eroding the bargaining position and voice of smallholder producers. Centers of cocoa production have shifted globally depending on the availability of virgin areas for planting and labor (Ruf 1995), and the political economy of global cocoa value chains (Fold 2005). Cocoa is predominantly a smallholder crop and a key ingredient to chocolate production. The value of the global chocolate market is estimated to be ten times the global cocoa market (Potts et al. 2014). Main actors of cocoa value chains are few manufacturers and grinders at the downstream and large numbers of smallholders at the upstream end. The grinding and manufacturing stage has become increasingly concentrated (Kaplinsky 2004). Currently, six large chocolate manufacturers hold 40% of the global market while

the eight largest grinding companies hold 75% of the market (Fountain and Hütz-Adams 2015). In some markets, e.g. the US market, the concentration of chocolate manufacturers is even higher (Capelle 2009). Advances in food chemistry and process technology have enabled industrial actors to cope with lower bean quality (Fold 2002) and medium- and low-quality bulk chocolate dominates a large share of the market (Losch 2002). Chocolate manufacturers compete on brand management and marketing; they try to contain the power of grinders by diversified direct sourcing from smaller suppliers (Fold 2002). The chocolate market is expected to divide into cheaper products of lower quality and higher-quality products (Nieburg 2013b) and the market for high-quality cocoa is increasing (Gilbert 2009). For example, in 2013, Barry Callebaut launched the brand 'Origin', which differentiates chocolate made from a single origin including Java and Cameroon (Nieburg 2013a; Barry Callebaut 2016). This article is based on a framework outlined by Mithöfer et al. (2017), which combines three concepts (Figure 1).

The issue-attention cycle concept analyses how concerns shape responses through the initial stage of scoping in which concerns are identified and the extent of the problem is assessed up to the final stage ('response') in which action is taken and solutions are implemented

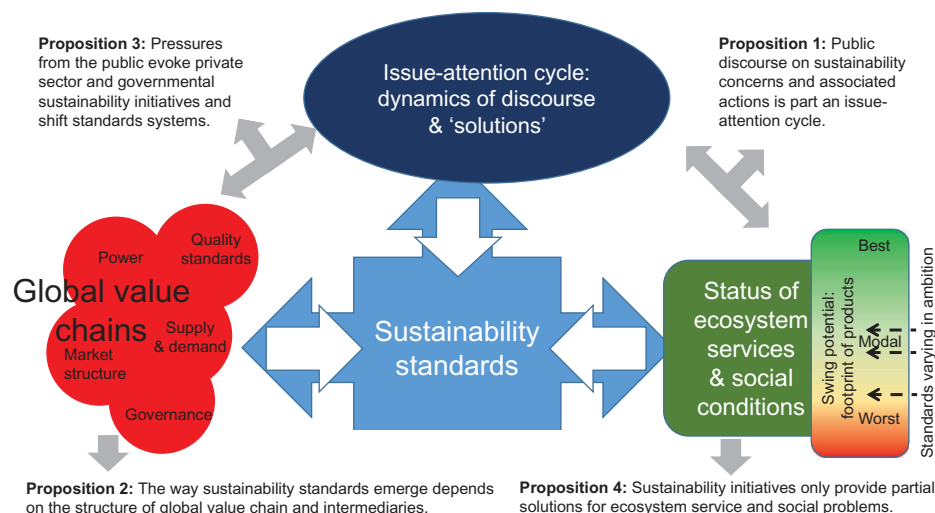


Figure 1. Conceptual framework (Mithöfer et al. 2017).

(Tomich et al. 2004). The global value chain concept analyses the links between actors engaged in the process of moving a product from production to consumption (Gereffi et al. 2005). The management swing potential concept refers to the gap between worst and best production systems with respect to the ecosystem services provided (Davis et al. 2013), economic or social impact (e.g. income generation, reliance on child or forced labor). The negative bottom line of the swing potential may trigger concern and responses in the form of sustainability standards, policies and development projects. The swing potential further captures the potential for improvement with respect to a particular concern. By linking producers and consumers value chains can transmit concerns as well as facilitate the design and implementation of collaborative responses (Mithöfer et al. 2017). Combining these three concepts (Mithöfer et al. 2017) identified four propositions:

- (1) Public discourse on sustainability concerns and associated actions is part of an issue-attention cycle.
- (2) The way sustainability standards emerge depends on the structure of the global value chain and intermediaries.
- (3) Pressures from the public evoke private sector and governmental sustainability initiatives and shift standard systems.
- (4) Sustainability initiatives only provide partial solutions for ecosystem service and social problems.

In particular we address the questions: (1) what are sustainability concerns – in particular of smallholder producers – in cocoa value chains? (2) how are cocoa value chains structured and what is the local swing potential? and (3) to what extent have sustainability standards, policies and development projects addressed

these concerns in particular of smallholder producers and to the provision of ecosystem services? Our analysis focuses on cocoa value chains originating in Indonesia, Cameroon and Peru representing a cocoa-producing sub-sample of 'learning landscapes' that were selected to be representative of agro-ecological systems, forest transition and populations density and for long-term monitoring of situations encountered in the tropics (Dewi et al. [this issue](#)).

Methods

Following Yin (2012), this article follows the single-case design with embedded multiple units of analysis. Cocoa constitutes the single case while the embedded multiple units of analysis are the three case study countries Indonesia, Cameroon and Peru. The global issue-attention cycle, which is described in the next section, constitutes the context of our case and to the units of analysis. It captures concerns and responses beyond the boundaries of our three countries of research. The sample of countries does not strive to be representative of all cocoa-growing areas or all major producer regions of certified cocoa. Rather, it represents the cocoa-producing sub-sample of 'learning landscapes' that were selected to be representative of agro-ecological systems, forest transition and populations density and for long-term monitoring of situations encountered in the tropics (Dewi et al. [this issue](#)).

Concerns related to sustainable cocoa cover social, economic as well as environmental dimensions and capture those of academia, public and private sector including smallholder producers. Concerns were identified via extensive search of the scientific cocoa literature at global as well as country level by using key word combinations of cocoa, cacao, value chains, certification, standard, sustainability, biodiversity,

environment and labor using the data bases ScienceDirect and Web of Science. Literature was screened according to its content's match to the research questions of the present article. Websites of large global public and private cocoa sector stakeholders were searched using the same key words. Popular media, project and gray literature were identified via Google and authors' networks in the case-study sites and countries.

In each country, data collection followed a standardized data collection protocol for secondary data to ensure collection of comparable information. In all three countries, interviews with farmers, NGOs, civil society bodies, government officials and representatives of the business sector contributed to identification of concerns at local level as well as policy responses, development projects and the implementation of voluntary sustainability standards. Farm-level information was extracted from previous surveys conducted for other projects¹ (Table 1). Information thus collected was then sorted in chronological order for further analysis.

Indonesia and Cameroon are among the top five global producers and top five global exporters, with exports reaching 0.18 and 0.19 megatonnes, respectively, in 2013 (Figure 2). Indonesia exports the largest volumes of processed cocoa beans. In 2008, cocoa covered 32% of the total area of Cameroon (MINADER 2010) and cocoa is grown predominantly by smallholders (Magne et al. 2014) ranging from 0.5 to 3 ha (ICCO 2014a). In the early 2000s, Peru's cocoa sector was small and in poor shape: disease problems and limited state support for smallholders led to a situation where 50% of the national area under cocoa was abandoned (Krauss and Soberanis 2001). However, between 2005 and 2013, cocoa production increased nearly threefold and the area under production more than doubled (INEI 2012). Exports of cocoa beans from Peru are of minor but increasing

importance. Peru and Indonesia are two of the top five standard compliant cocoa producers (Potts et al. 2014). Indonesia mostly produces for the Malaysian and US markets while Cameroonian and Peruvian is mostly exported to Europe (ITC 2015).

The case-study sites (Figure 3) represent a gradient of cocoa-production systems with respect to the history of production on each site as well as a gradient of cocoa quality (Table 2). Sulawesi, Indonesia, represents a well-established cocoa-production system with low-quality bulk cocoa production and accounts for about 70% of Indonesian cocoa production and farmers. The case study focuses on South, Southeast and West Sulawesi.

Central Region of Cameroon also represents a well-established cocoa-production system with a gradient of intensity of production due to differences in population density and closeness to markets. The country produces bulk cocoa but with particular high-quality attributes in terms of color (Amores et al. 2007). For the past decade, Irazola District, Ucayali, Peru, like the rest of Peru, has been experiencing a major expansion of its cocoa production. Peru produces bulk cocoa but with potential for the production of fine-flavored cocoa (van der Kooij 2013). In all three countries, cocoa is grown typically in agroforestry systems with varying density of shade trees (Table 2).²

Global issue-attention cycles in cocoa

Cocoa has a long history of attention to concerns and actions taken by a range of public and private actors (Figure 4). First ecological concerns were raised in the 1980s. Forced labor concerns date back to 1905 (Sackett 2008) while child labor in West Africa moved into focus around the year 2000 following reports of human rights organization and a subsequent study by the International Institute of Tropical

Table 1. Sources of farm-level information by country case study.

Indonesia	Cameroon	Peru
Focus group discussions and in-depth interviews were held with key stakeholders specifically: 13 certified farmers, 45 non-certified farmers, two representatives of certified cooperatives, four representatives of non-certified cooperatives, two representatives of cocoa associations, two certified buyers, nine non-certified buyers, five representatives of NGOs, three government officials and two staff of the cocoa research institution. Information is further derived from interaction with 2880 farmers whom we weekly worked with for five years, and an overall of 13,300 farmers (including the 2880) who attended agroforestry training where cacao was a priority topic in South and Southeast Sulawesi.	Interviews of 14 cocoa farmers, of which eight held positions or were delegates of cooperatives or common interest groups, six officials of the Ministries of Agriculture and Commerce, one representative of the National Cocoa and Coffee Board, one major input supplier and one major cocoa buyer.	Interviews of 201 smallholders including 75 households having either certified cocoa plots or in the process of certifying their plantations. Further, 15 key informant interviews were conducted including six interviews with technicians from the local farmers' cooperative, two with local directors of cacao development programs supported by bilateral donors, four with representatives of the local government, one of a manager of a certification agency, and two with local leaders (who had been president of the local cooperative and involved in other local organizations to promote cocoa production).

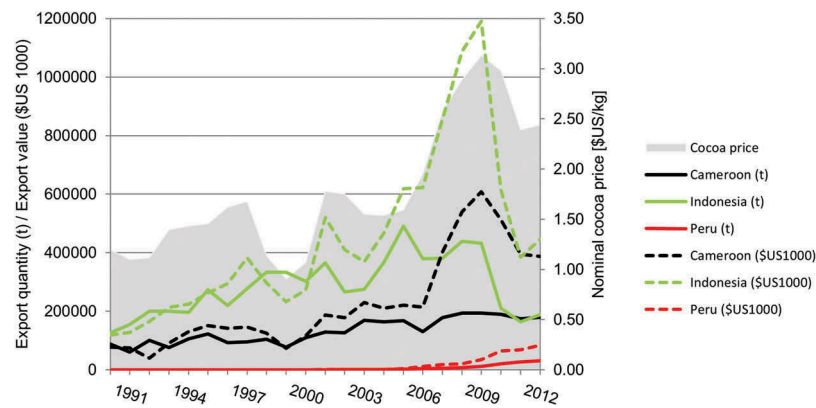


Figure 2. Cocoa price and cocoa bean exports from Indonesia, Cameroon and Peru 1991–2013 (based on GEM (2015), FAOSTAT (2016)).

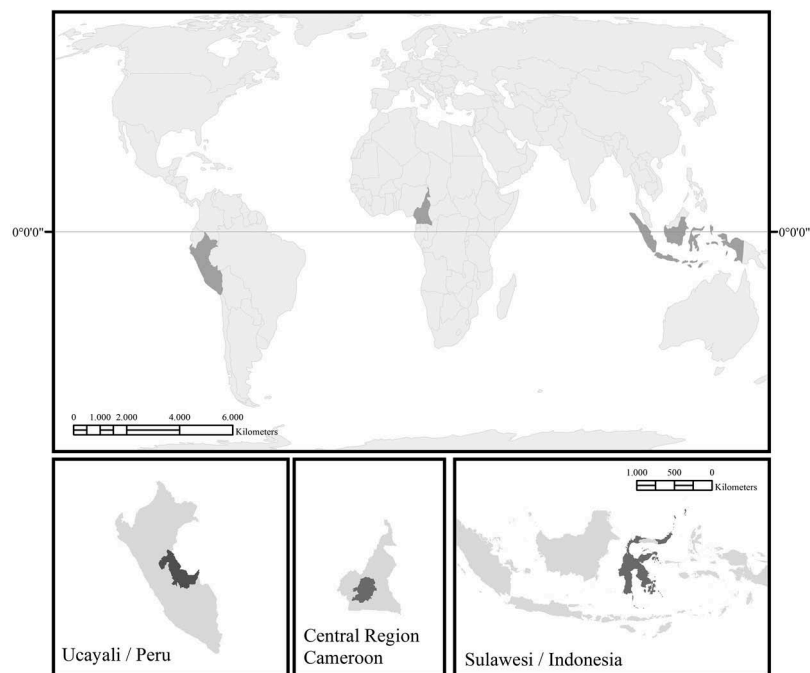


Figure 3. Country case study sites (based on GADM database of Global Administrative Areas, Version 2.8 (gadm.org)).

Agriculture (IITA 2002). The broad-term sustainability started to be used from 2000 onwards.

Responses addressing such concerns have increased in frequency, broadened public awareness and reached large coalitions of diverse actors: between 2010 and 2015 several large initiatives, which included private sector partners, were launched as well as the launch of a body of the United Nations, the United Nations Forum on Sustainability Standards (Figure 3). Responses further include certification to so-called sustainability standards, which include the standard itself as well as an associated certification system (Milder et al. 2015). These originated in consumer countries striving to counter a variety of concerns ranging from the high degree of chemical input use, addressed by organic standards resulting in the first sale of organic chocolate in 1989 in Germany (Pay 2009), to low producer prices, addressed by Fairtrade resulting in first sales of Fairtrade certified chocolate in 1994 (Potts

et al. 2014). Rainforest Alliance and UTZ Certified (UTZ) are further widespread cocoa sustainability standards. Despite differences in initial motivation, all four standards now address environmental, economic and social concerns (Table 3).

All four standards uphold labor standards and include measures to reduce the negative impact of primary production on ecosystems. Beyond this, Rainforest Alliance requires maintenance of at least 12 native tree species per hectare, two strata and canopy density of 40% (SAN 2010); organic requires the maintenance of wildlife habitats (IFOAM 2014); Fairtrade requires activities enhancing biodiversity buffer zones (FLO 2011); and UTZ requires at least 12 shade trees per hectare (UTZ 2015a). Fairtrade is the only standard to guarantee minimum prices and premiums to farmers. Organic does not allow the use of synthetic inputs and encourages farmers to implement ecologically sound production practices.

Table 2. The cocoa sector in the study sites in Indonesia, Cameroon and Peru.

	Indonesia	Cameroon	Peru
Category of cocoa beans	Bulk, low quality	Bulk, particular quality attributes (color and fat content)	Bulk, potential for fine-flavored cocoa
Cocoa variety	Forastero trees	Trinitario trees	CCN-51 <i>Criollo</i> trees
Main trading partner (2014 export share)	Malaysia (24%)	European Union (77%)	European Union (61%)
Cocoa area (million ha)	0.5–1.7	0.67	0.1
Cocoa producers	2.2 million households	450,000	45,000
	Sulawesi	Centre Region of Cameroon	Irazola district, department of Ucayali
Cocoa area	950,000 ha	123,120 ha	13,700 ha
Cocoa producers	1.5 million households	75% of local population (400,000–500,000 households) in Central Cameroon	n/a
Production volume (share in national production)	235,000 t/year (67%)	90,000 t/year (35%)	7%
Size of cocoa farms	0.5–2 ha	1–3 ha	30 ha of which 3 ha is under cocoa
Smallholder cocoa production system	Full-sun monoculture, shade cocoa, mixed systems dominated by cocoa and home gardens where cocoa is a minor component	In agroforestry systems of varying species diversity	Agroforestry systems with diverse portfolio of trees for permanent shade
Cocoa income	1450 US\$ annual gross income per household	995 US\$/ha annual gross income; 33 US\$/ha net income	3500 US\$ annual gross income per household

Sources: Amores et al. (2007), van der Kooij (2013), ITC (2015), BPS (2010), DGEC (2012), Janudianto et al. (2014), Hafid and McKenzie (2012), Janudianto et al. (2012), Wau (2015), Neilson et al. (2011), Khususiyyah et al. (2012), Magne et al. (2014), Mbondji (2010), ICCO (2014a), CICC (2015), Sonwa et al. (2007), NCCB (2014), INEI (2012), Silva et al. (2015), FAOSTAT (2017), DRSA (2013).

Rainforest Alliance and UTZ contain compliance criteria on traceability, while Fairtrade includes provisions on democratic governance of farmer organizations (SAN 2010; FLO 2011).³

Adoption of sustainability standards by business serves risk management as well as product differentiation (Hartmann et al. 2010; Henson and Humphrey 2010) in particular in mature markets as has been shown by Ponte (2002) for coffee. It was estimated that in 2012 22% of the global cocoa production was certified, of which 33% was estimated to also be actually sold as certified (Potts et al. 2014).⁴ Since 2000, concerns have changed their focus from sustainable production to sustainable sourcing to certification. Initially, sustainability labels were taken up by specialist brands but from 2008 also mainstream brands adopted sustainability labels. Mars, Ferrero and Hershey's committed to sourcing of 100% of their cocoa sustainably in 2009, 2010 and 2012, respectively (Ferrero 2011; Hershey's 2012; Mars 2016), which translated in coalitions between these chocolate manufacturers and sustainability standards resulting in wide spread of the standards. However, in 2017, large retailers started to withdraw from third-party sustainability standards and certification in favor of company-own standards (Boland 2017; Vidal 2017).

Since 2005, efforts have been made to create a common understanding of sustainable cocoa (ICCO 2014b) and the role of different certification schemes in achieving sustainability goals (ICCO 2015). Parallel to this broader sustainable cocoa issue-attention cycle, individual issues still continue to appear. Recent concerns and responses focus on women in cocoa value chains. In 2013, Mars, Nestlé and Mondelez committed to Oxfam's request to ensure interests of women cocoa farmers (Oxfam 2013) and signed up to the United Nations Women Empowerment Principles (Mondelez International 2014; Nestlé 2016; Parkin 2016; UN Women 2016). Further, recent concerns are the living wage and shared responsibility amongst supply chain actors (Fountain and Hütz-Adams 2015; ISEAL 2016). In 2017, attention shifted to deforestation-free cocoa supply chains (Kroegeer et al. 2017) and associated pledges by cocoa supply chain actors (GISCO 2017).

Buy-in to sustainable cocoa increased over time. The Abidjan Cocoa Declaration of 2012 is a non-binding collective statement of numerous private and public sector actors aiming to work toward improved working and living standards and sustainability of production (ICCO 2012). In 2015, chocolate manufacturers launched the joint Cocoa Action Plan, which provides a common framework for consistency of single chocolate producers' actions toward achieving sustainable cocoa. The Cocoa Action Plan focuses on increasing cocoa productivity through the use of high-yielding planting material (Consultative Board on the World Cocoa Economy 2014).

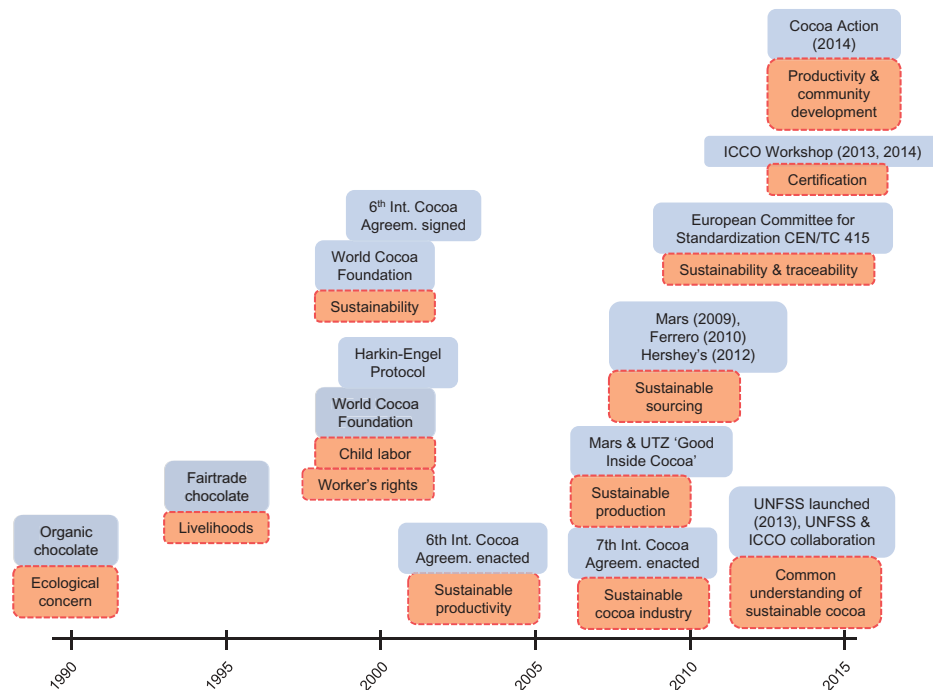


Figure 4. Sustainability concerns and actions taken by global actors toward sustainability goals in cocoa.

Sources: based on United Nations (1993); UNCTAD (2001); Ferrero (2010); ISEAL (2011); UNCTAD (2011); Hershey's (2012); Steijn (2012); Nestlé (2013); UNCTAD (2013); Consultative Board on the World Cocoa Economy (2014); Mars (2014); Potts et al. (2014); World Cocoa Foundation (2014); Fountain & Hütz-Adams (2015); ICCO (2015); ISEAL (2016).

Note: blue boxes denote concerns, red boxes denote actions taken.

Apart from private sector initiatives, the sector and its value chains is governed by international agreements. The 6th International Cocoa Agreement of 2001 regulates sustainable cocoa defined as 'maintaining productivity at levels that are economically viable, ecologically and culturally acceptable through the efficient management of resources' (UNCTAD 2001, p. 7). The 7th International Cocoa Agreement of 2010 adds focus on the standard of living and working conditions to the focus on a sustainable cocoa industry (UNCTAD 2011). Further, for example, in December 2014, the EU's Law on Food Information to Consumers, Regulation (EU) No 1169/2011 (EU 2011), came into effect, which among other concerns regulates origin labeling. Cocoa and chocolate origin labeling is still under discussion (Nieburg 2014). The industry worries about difficulties in implementation given current blending practices (CTA 2014) and cost increases (Nieburg 2014). The cocoa chain is also subject to food safety regulations curbing concerns of pesticide residues, mycotoxins, chemical residues and heavy metals (CBI 2014).

Case studies

Sulawesi, Indonesia

Smallholder concerns

Cocoa production and marketing is challenged by multiple concerns from the farmers' perspective

(Table 4). Market prices fluctuate frequently, and information regarding current prices is not readily available. Few farmers compare prices by visiting markets or contacting friends and family in other communities, because this results in only slightly better prices that do not compensate the additional effort (Perdana and Roshtenko 2012). In South and Southeast Sulawesi, women are responsible for negotiating price and receiving payment. The Sulawesi market is primarily for bulk unfermented beans leaving farmers less leverage for price negotiation. Collectors often buy beans that have not been sufficiently dried. Those beans require further drying by collectors and traders.

Farmers do not know in advance when collectors will visit communities and farmers. Collectors coordinate with each other to allocate areas of operation so that in practice cocoa-producing communities are left with few options to sell their produce. In Southeast Sulawesi, community organizations – Lembaga Ekonomi Masyarakat (LEMs) – buy cocoa and sell the cocoa produced by members and non-members. LEMs face the same marketing problem as individual farmers. LEMs' members and client farmers may sell cocoa to outside collectors when higher prices are offered. As government-assisted enterprises, LEMs may be pressured to sell to specific traders or manufacturers, even if the price offered is not the best available. Few cooperatives with up to 1000 member farmers operate in West Sulawesi. Membership

Table 3. Initiators, initial concern and current focus of selected sustainability standards in cocoa.

Standard	Founding date	Founding organizations	Initial concern and current focus
IFOAM	1972 (early initiatives in 1967) 1997	Union of national and regional organic movements NGOs	Use of external inputs. Current focus on the principles of health, ecology, fairness and care.
Rainforest Alliance/Sustainable Agriculture Network	1997 (early initiatives in 1988)	Organizations in the United States and Europe	Deforestation and extinction of species in tropical forests. Current focus on sustainable agriculture.
FLO (Fairtrade)	1997	Dutch Ahold Coffee Company & Guatemalan coffee producers	Livelihoods of the poor, terms of trade. Current focus on sustainable livelihoods.
UTZ Certified	1997		Transparency along the supply chain, responsible coffee production. Since 2002, UTZ is independent from initial partnership and branched into cocoa. Current focus in cocoa on sustainable farming.

Source: FLO (2017); IFOAM (2017); Potts et al. (2010); SAN (2017); UTZ (2017).

Table 4. Producer concerns in Indonesia, Cameroon and Peru.

	Indonesia	Cameroon	Peru
Social	Dependence on few buyers who visit infrequently; market risk; shift to other crops; high cost of living	Power struggles within producer organizations; aging cocoa farmers and labor shortage	High risks (crop destruction by military/law enforcement) and social stigmatization associated with production of coca (produced on same farms as cocoa, potentially important source of funds for coca crop expansion)
... at producer organization level	Producer organizations not present	Power struggles within organizations	Weak cooperatives with limited influence among buyers, government agencies and development actors
Economic	Low yields, quality and prices; dependence on buyers' input and credits; low income from cocoa compared to the past; high input prices	Low cocoa prices; low yields; limited access to good quality input (fake inputs); unreliable access to inputs; high input prices; poor knowledge on inputs; inaccessibility of credit; poor infrastructure; remoteness	Declining yields after 10 years from establishment due to poor management practices, limited input application, pests and diseases; high and rising costs of key production inputs (chemical fertilizer, labor); limited access to credit for on-farm production
... at producer organization level	–	Competition from local buyers.	Develop viable strategies to increase production and productivity; improve quality and secure market access for local production; add value to cocoa, mainly through certification; build producer organization capacity and coordinate interventions among the various stakeholders operating in the district; strengthen business capacities
Environmental	Increased use of agrochemicals to reverse declining yields with potential negative health effects; environmental pollution	Pests; mismanagement of shade	Increased incidence of pests and diseases (linked to climate change and lack of application of good practices); loss of soil fertility and erosion (linked to poor management practices and limited application of inputs); climate-related irregularity impacts production and management calendar
... at producer organization level	–	–	Interest in voluntary carbon market based on successful examples of other groups in other regions

Source: Key informant and farmer interviews.

is voluntary and does not require a fee but most farmers market their cocoa individually.

Producers are concerned that cocoa is no longer a good source of income due to decreasing yields, quality and prices. Current average yields varying from 300 to 800 kg/ha (Neilson et al. 2011; Rahmanulloh et al. 2012; Wau 2015) compare poorly to the yields of 1500–2000 kg/ha reported by farmers as common in the 1970–80s. The loss in production is due to reduced soil fertility following many years of cultivation, the lower productivity of many old trees and widespread pest and disease problems. This condition encourages farmers to switch to alternative crops. Returns to land are \$375/ha/year for cocoa monocultures; and \$450–560/year for mixed cocoa systems. Other crops offer better financial returns for farmers. Returns to land are \$2299/ha/year for pepper monocultures, \$3239/ha/year for clove agroforestry systems and \$2567/ha/year for mixed fruit-timber agroforestry systems (Rahmanulloh et al. 2012). Consequently, some smallholders are diversifying their livelihood systems from a focus on cocoa to include rubber, clove, durian or any other crop that will provide stable income. This in return gives raise to concerns by traders and exporters regarding the quantity and quality of cocoa available.

Public responses addressing concerns: policies and development projects

Indonesia is a signatory to the 7th International Cocoa Agreement 2010 as well as the Abidjan Declaration. Further country-level responses include policies and development projects (Table 5). Policies have focused on the expansion of cocoa production from the 1980s onwards via the Rehabilitation and Expansion of Export Crops program, which promoted the expansion of cocoa production in Sulawesi. This promotion continued in the 1990s with the Plantation Development in Special Areas program, which facilitated the cultivation of commodity crops by smallholder farmers. In 1996, foreign investment policies permitted foreign companies to purchase cocoa directly from farmers. That change enhanced competition, provided financial benefits to farmers and increased investment. In 2009, the focus switched to productivity and quality via the government-initiated National Program to Increase the Production and Quality of Cocoa, which aims to reverse the decline of cocoa production by rehabilitating and intensifying 450,000 ha of smallholder cocoa. The government established national standards for cocoa in 2008, promoting the production of quality cocoa (BSNI 2016). Certification indicators for sustainable cocoa production have been developed with coordination between the private and public sectors, and, in 2010, the government defined

national sustainability standards for cocoa. However, the indicators have not yet been enacted. In 2010, a progressive export tax was instituted to strengthen the prospects of the domestic cocoa sector sourcing their raw material from domestic production (Wau 2015). Due to the export tax and government programs to increase cocoa production, Indonesia has experienced vast increases in grinding capacity via investments by multinational and national companies (Insight Alpha 2012); in 2014, grinding capacity was expected to increase by 85% over the 2013 capacity of 600,000 t (Supriatna and Taylor 2014). However, there is concern that the tax will reduce local market prices, further prompting farmers to convert cocoa systems to other commodities.

Parallel to policy changes, multiple development projects targeted the cocoa sector (Table 5). While primarily focused on increasing productivity, these efforts also addressed social and environmental concerns, such as provision of extension services, agribusiness development, diversifying and sustaining cocoa systems, integrated pest management and loss of biodiversity. Since 2003, the cocoa industry (Mars, Nestlé, Cargill) has been involved in funding and implementing cocoa development projects.

Spread of sustainability standards

Rainforest Alliance and UTZ started operations in West Sulawesi in 2010 through the trader Armajaro (VECO 2011) in collaboration with the government. In 2013, Rainforest Alliance initiated some activities in South Sulawesi. In both cases, farmers operate under buyer-owned certificates. In West Sulawesi, certified cocoa generates a price of about 20% higher than non-certified produce, which is mostly attributable to the increased competition amongst buyers triggered by the operation of the sustainability standard. However, in Southeast Sulawesi, premiums for certified cocoa are only 5–7% (Wau 2015). Farmers who have undergone cocoa certification awareness or training feel they benefited by learning how to increase productivity and becoming more aware of quality, markets and other cocoa-related issues. However, generally, price premiums paid for quality, certification to a sustainability standard or fermentation are considered inadequate to cover the related management costs. Farmers who have completed certification feel that a premium of 30% is justified and should be guaranteed. Those same farmers agree that certification could harness the swing potential toward more sustained production of cocoa in terms of maintaining cocoa production as component of their mixed cropping systems if incentives – sufficiently higher premiums – were guaranteed. Farmers view certification programs as primarily intended to benefit the cocoa industry and traders (Wau 2015).

Table 5. Timeline of policy frameworks and projects addressing environmental and social sustainability in cocoa in Indonesia, Cameroon and Peru.

Years	Policies										Projects																	
	Rehabilitation	Plantation development & expansion	Climate change mitigation	Investment & trade	Local processing	Quality standards	Sustainable cocoa standards & certification	Quality statistics	Producer organizations	Finance production & marketing	Productivity	Expansion	Rehabilitation, rejuvenation, intensification	Improved planning material	Improved production	Pest & disease control & IPM	Cocoa quality	Agroforestry systems & NRM	Sustainable production	Sustainability partnerships	Marketing & diversification if income	Extension services	Smallholder business development	Producer organizations	Market & price information systems	Certification	Attract the next generation of farmers	Infrastructure & processing
1950s																												
1960s																												
1970s																												
1980s	I	I																										
1990s		I		I		C		C	C	C																		
2000s	C					IC			C	C	C		IC	C	C	IC	P	P	P	I	C	ICP	IC	P	C		C	
2010s		P	P	P	I		IC		P		C	C	C	C		I	P	P	P	I	I	P				P		C

IPM: integrated pest management; NRM: natural resource management; C: Cameroon; I: Indonesia; P: Peru.
Source: Key informant interviews, policy and project documents identified in key informant interviews. Further detail on these projects is included in tables of the appendix.

Central region, Cameroon

Smallholder concerns

In Bokito and Ayos, local buyers have forged long-term relationships with cocoa producers (Coulibaly 2012). They do not always pay cash but sometimes lend money to farmers. This transaction results in relational governance structures with mutual dependence of cocoa farmers and their buyers. This leaves farmers unable to sell to alternative buyers and buyers tied to producers. Only large-scale producers, who are often also the organization promoters, entrust their entire production to farmer organizations. Although legally producers of government projects are supposed to sell to producer cooperatives or federations, in practice they also sell to local buyers who they know. Exporting is highly concentrated; three companies purchase around 90% of the cocoa beans via six agents acting on their behalf. Despite the interest by the Cameroonian authorities and efforts to strengthen local cocoa processing via the Agropole Programme in the 2010s (Appendix Table A2), local processing is limited to two main operators who locally process some chocolate, cocoa powder and cocoa butter for seasonal local consumption.

Scientists have raised concerns of vulnerability to climate change of cocoa in the country (Schroth et al. 2016). Deforestation also ranks as a major environmental concern (Dkamela 2011; Tegegne et al. 2016) and forest degradation is prevalent (de Wasseige et al. 2012). Ultimate drivers of deforestation are linked to urbanization and the growing middle class and extensive farming practices (Lambin and Meyfroidt 2011) and the expansion of (cocoa) plantations (Tegegne et al. 2016). Cocoa constitutes a direct driver of forest degradation due to destruction and modification of forest structures. Producers are concerned about pests and the mismanagement of shade in cocoa production systems (Table 4).

Economic concerns focus on prevalence of diseases (Ndoumbe-Nkeng et al. 2004; Efombagn et al. 2011) and old age of cocoa trees (Wessel and Quist-Wessel 2015). Cocoa production is low with yields of 440–720 kg/ha compared to 800–1500 kg/ha recommended by Sys et al. (1993). After liberalization in 1994, producers have integrated food crops (maize, cassava and other tree crops) in cocoa production systems. Cocoa farmers worry about low prices and yields and poor access to input markets (Table 4). They diversify their production system as a risk-management strategy to buffer volatile cocoa prices.

Social concerns at the producer level include labor shortages which is increasingly scarce and expensive due to the rural exodus of youth. Farmer organizations are plagued by corruption

and power struggles (Table 4). They have been taken over by local leaders at the expense of marginalizing smallholders (Achancho 2012). Producer organizations are concerned about competition from local buyers (Coulibaly 2012).

Public responses addressing concerns: policies and development projects

Cameroon is a signatory of the 2001 and 2010 International Cocoa Agreements and the Abidjan Declaration following the World Cocoa Conference in November 2011. Due to the economic importance of the sector, numerous policies and development projects have shaped the cocoa sector (Table 5). Rehabilitation and improved planting material are a continued and recurring focus being the core of several interventions.

Due to the potential for high-quality cocoa, policies on grading and cocoa quality are well established, dating back to 1958 (Hall 1970) with updates over time. Cooperatives receive policy support since the 1990s. The OHADA Uniform Act on Cooperatives provides a support structure to certification initiatives by strengthening farmer organizations. Rational use of pesticides has been addressed by policies since the 2000s. Cameroon is committed to initiatives toward achieving sustainability in the cocoa value chain but this has not yet taken effect at producer level. In this respect, according to the Ministry of Agriculture and Rural Development (MINADER) and the Ministry of Trade (MINCOMERCE), since the 2010s the state is fully involved in setting standards, and the protection and promotion of origin and label.

Diverse development projects have been implemented in cocoa including the Centre Region (Table 5). Many of these focus on the availability of improved varieties, the dissemination of best agricultural practices, improved infrastructure, the organization of producers into cooperatives to facilitate marketing, access to inputs, credit and information and incentive schemes to motivate the younger generation of cocoa farmers.

Spread of sustainability standards

Fairtrade, Rainforest Alliance, UTZ and organic standards operate in the country but not evenly in all cocoa production regions. In Bokito, Rainforest Alliance in partnership with farmer organizations is actively developing certification schemes. This initiative has provided new opportunities for smallholders who are able to capture higher prices for their cocoa. In Ayos, some farmers are aware of certification but not certified since companies not yet source certified cocoa from here. Companies can still source sufficient volumes of certified

cocoa from farmers in Bokito and others near the capital.

Ucayali, Peru

Smallholder concerns

Cocoa's expansion has brought to the surface multiple, sometimes conflicting, concerns among stakeholders at nested scales. Farmers aim to ensure the viability of cocoa production in the face of a series of constraints (e.g. high labor and input costs, volatile cocoa prices and limited options to diversify on-farm income) (Table 4). The environmental dimension mostly concerns maintaining cocoa yields due to soil erosion, outbreaks of pests and diseases and extreme climate events. Low population densities, combined with urbanization and the rapid rise in oil palm production (Gutiérrez-Vélez et al. 2011) in the district have made hired labor relatively expensive.

Cooperatives in Ucayali face pressures to build their administrative capacity (Donovan et al. 2017), expand and consolidate their supply base (often in the face of intensive local competition for cocoa from members) and search out new options to add value to cocoa beans through certification.

At the national level, cocoa buyers have been chiefly concerned with achieving access to sufficient volumes of cocoa in a competitive environment where local institutions for organizing and promoting smallholder cocoa production are still evolving. From the perspective of government agents in Ucayali, the principal challenges include developing a viable option to discourage the production of illegal crops (coca), and transitioning toward less government-provided technical assistance and input support without threatening the expansion of the cocoa sector. In addition, regional environmental agencies are becoming increasingly concerned about the deforestation and degradation caused by the expansion of this commodity sector, with little respect for Land Use Zoning Plans and National Classification of Land Suitability, including the compliance with land title acquisition processes. Regional agencies are often blamed by national authorities and environmental/advocacy NGOs for their lack of capacity in enforcing legal prescription about land use change and allocation of land rights.

Public responses addressing concerns: policies and development projects

Peru is a signatory to the 7th International Cocoa Agreement 2010. Only since 2010 has cocoa started to be the focus of national-level agencies in policymaking and the implementation of projects (Table 5). The Ministry of Agriculture's (MINAGRI) main objective has focused on helping farmers to increase productivity

and increasing export earnings by positioning Peru as an exporter of high-quality fine-flavored cocoa. They have focused efforts on supporting farmers' cooperatives and strengthening their ability to provide services to their members and negotiating with buyers and other actors in the value chain. Where environmental concerns captured MINAGRI's attention, they have focused mostly on reducing pollution from on-farm activities (e.g. the use of agrochemicals) and ensuring compliance with export requirements (e.g. addressing presence of cadmium in cocoa). The Ministry of Environment (MINAM) strives to control unplanned deforestation driven by migration and illegal encroaching of land. The ministry, with the support of the international cooperation under the German Norwegian fund, works to evaluate the feasibility of innovative platforms for sustainable cocoa under various governance and private-public sector schemes such as Carbon Neutral Cocoa and Deforestation Free Cocoa, envisioned also in the National Strategy of Forest Conservation and Climate Change (MINAM 2015). The two ministries have recently agreed to include cocoa agroforestry and the adoption of good practices of land management as part of the Nationally Appropriate Mitigation Actions Concept presented at the COP 20 in Lima in 2015 (MINAGRI-SERFOR 2014). The National Antidrug Agency (DEVIDA) has objectives similar to those of MINAGRI but with a focus on expanding cocoa in those areas where illegal crops persist or recently decreased.

Civil society, particularly NGOs, have been important in expanding the area under cocoa, as well as in bringing to light the negative environmental consequences of the expansion. Table 5 identifies key projects in the Ucayali region with a focus on cocoa each benefitting 250–3000 cocoa farmers. Most programs focus on enhancing infrastructure (e.g. building warehouses and providing post-harvest equipment to cooperatives) and providing inputs and services for cocoa expansion. Few projects have focused on sustainable production. So far, there have been few efforts in developing markets for Peruvian cocoa or enhancing the business/farm management skills of smallholders. There are many groups working to protect the Amazon forest by working to conserve land as well as encouraging sustainable production practices, in an effort to protect biodiversity and mitigate climate change. A specific concern of these groups is to stop deforestation that may be due to cocoa expansion particularly as migrants from the Andean region to the Amazon deforest to plant cocoa and other crops. However, few interventions by these groups have been identified in the cocoa growing region of Ucayali. In addition, the government-based programs Promcompite and Agroideas provide small grants to producer organizations for innovations (e.g. infrastructure, technical assistance,

extensionists). While these programs do not focus primarily on cocoa production, grants have been important for cocoa cooperatives in Ucayali and elsewhere.

Spread of sustainability standards

In Irazola, the six largest cooperatives all sell UTZ-certified cocoa; however, the cooperatives have sought additional certifications, namely Fairtrade, organic, and more recently Rainforest Alliance. All of the cooperatives were initiated with external support by NGOs in collaboration with other authorities or associated projects and the support of the Alternative Development Program. In some cases, cooperatives were formed some years prior to the recent cocoa boom, but only acquired significant membership and sales volumes in the wake of the boom. The involvement of buyers in cocoa production and post-harvest treatment is new in the region. Buyers have provided technical assistance and facilitated access to credit (use of buyer contracts as collateral) and certification. A recent assessment of the compliance criteria of UTZ, Fairtrade and organic standard systems regarding trees species and forest conservation indicated that compliance with these elements of the standard did not require farmers to change their current farming practices. Current technological advice aims at enhancing productivity and overall economic performance of the systems, rather than achieving enhanced biodiversity or conservation (Dehu 2014). The inclusion of companion trees in the cocoa plantations is mostly for commercial purposes with limited consideration of the actual suitability and fit of the species association proposed. Besides certification, some cooperatives are exploring the possibility of engaging in carbon credit schemes under the voluntary market.

Discussion

What are sustainability concerns – in particular of smallholder producers – in cocoa value chains?

In all three countries, cocoa producers expressed social and economic concerns including limited access to external inputs and services, weak cooperatives and producer associations, limited options to increase benefits from cocoa production, low prices and dependence on a small set of buyers. Pest pressures are an environmental/economic concern in all three countries. In Indonesia, producers' environmental concerns further included environmental pollution stemming from the inappropriate use of agrochemicals. In Cameroon, environmental concerns also were the mismanagement of shade resulting from a lack of knowledge on feasible cocoa and shade tree densities as well as shade tree species

choice. Peruvian producers worried about cocoa yields in general especially in the context of climate change. At the global level, concerns have changed over time and 'sustainability' has grown into a commonly used umbrella term associated with an increased density of policies and programs of public and private actors.

How are cocoa value chains structured and what is the local swing potential?

Cameroon and Peru mostly produce for consumers in the EU while Indonesia produces for the Malaysian and US markets. The structure of marketing and governance at the first-level node of the global value chains vary across the three case study countries (Table 6). The greatest difference in structure is in the presence of producer organizations. The majority of Sulawesi farmers sell individually via a spot market transaction at farm gate; buyers are few and visit infrequently leaving farmers in weak bargaining position. In Cameroon, producer organizations are present though weak in their representation of producers' concerns though being supported by national policies. Power struggles and corruption distract from acting on behalf of the members. Buyers are based in the area and cocoa producer-buyer relationships have been built over time. Extension of credit to producers has created a system of mutual dependence, and, from the farmer's perspective with little choice of selling to alternative buyers for better prices. Producer organizations are present in Peru and – with the support from outside NGOs – are instrumental in linking smallholders to better paying markets for certified produce. Cooperatives face strong competition from local intermediaries for the purchase of their members' cocoa, and often depend on external financial support to provide technical assistance to members. However, they have been able to forge partnerships with buyers and provide their members with access to one or more certification systems. These structural differences between the three study sites also reflect differences in the extent of vertical coordination.⁵ Vertical coordination is not present in Indonesia, but present in Cameroon and Peru characterized by the extension of credit as well as the provision of technical advice in the case of Peru. This heterogeneity was also described by Swinnen and Maertens (2007).

In Indonesia and Cameroon, the swing potential at household level of smallholder cocoa production in terms of provision of ecosystem services is significant and tied to the diversity of the cocoa production system ranging from smallholder monocultures in Indonesia and diverse cocoa agroforestry systems in both countries (Table 6). These diverse multiple species cocoa agroforestry systems store large quantities of carbon (Somarriba et al. 2013), contain greater biodiversity

Table 6. Cocoa marketing, vertical coordination, governance of cocoa value chains and swing potential in cocoa production sites in Sulawesi (Indonesia), Centre Region (Cameroon) and Ucayali (Peru).

	Sulawesi, Indonesia		Centre Region, Cameroon		Ucayali, Peru
	Market access, vertical coordination and governance of cocoa value chains at producer – first-level buyer node				
Presence of producer organizations	Low		High		High
Age of producer organizations	-		Old		Recently established
Producers cocoa marketing strategy	Individual marketing of cocoa at farm gate, spot market transaction based on price		Via producer organization or individually to local buyers		Via producer organizations
Buyer structure	Few buyers, based outside the area, liaise with each other to allocate of operation thus in practice reducing farmers market options		Few buyers, based in the area, long-term relationships		International buyers in partnership with NGOs
Presence and characteristics of vertical coordination	None, direct payment in cash		Buyers sometimes extend credit for production inputs during production period		Buyers in collaboration with NGOs provide technical assistance and credit
Governance structure at producer—first-level buyer value chain node*	Market		Relational		Modular
Processing at national level	Being encouraged by recently instituted export tax		Limited amounts for local consumption, recent government funding		Limited
Presence of sustainability standards	Rainforest Alliance, UTZ		Rainforest Alliance		UTZ, Fairtrade, organic Rainforest Alliance
Swing potential					
Cocoa prices	Low (bulk cocoa)		High (potential for fine flavor)		High (potential for fine flavor)
Productivity	High (rejuvenation, management)		High (rejuvenation, management)		Low (prevent declines in productivity)
Shade and biodiversity	High		High		High

Sources: analysis based on key informant interviews.

* Classification based on Gereffi et al. (2005) and Ponte and Sturgeon (2013).

(Schroth and Harvey 2007), improve soil fertility (Tondoh et al. 2015) and provide flexible management options (Smiley and Kroschel 2008; Somarriba et al. 2013). Diversified systems provide stable income to farmers in times of low cocoa prices (Rahmanulloh et al. 2012); however, this is to the disadvantage of traders who are not able to source satisfactory quantities of cocoa. Indonesia and Cameroon show large differences between current levels of productivity and those of the past; currently, low levels are attributed to degraded soils, old trees and diversification into other crops that provide better returns to land and labor. In Peru, the upward swing potential in terms of productivity is lower due to cocoa's recent establishment. Here, the biggest environmental problems associated with cocoa expansion – the downward swing potential – are deforestation, low species diversity and carbon stocks on-farm and limited consideration for conservation and other ecosystem services at the field and landscape level.

To what extent have sustainability standards, policies and development projects addressed these concerns in particular of smallholder producers and to the provision of ecosystem services?

Responses to concerns include development and adoption of sustainability standards such as organic standards, Fairtrade, Rainforest Alliance and UTZ Certified policies as well as development projects. Responses have grown into large coalitions encompassing government agencies, NGOs and multinational industry actors. Following the 6th and 7th International Cocoa Agreements, a sustainable cocoa economy is defined as productivity levels that are economically viable, ecologically sound and culturally acceptable taking into account standard of living and working conditions (UNCTAD 2001, 2011). Attempts at collective action such as CocoaAction by the big players in the chocolate sector and schemes by individual company such as Mondelez' Cocoa Life, Nestle's Cocoa Plan should be seen as efforts to improve or stabilize cocoa production, which has been declining in terms of quality and quantity over the last few years (ICCRI 2010; Barjolle et al. 2013).⁶ While these initiatives are primarily focused on ensuring production (sustaining production), they do follow certain standards with social, environmental and social parameters. The arrival of ISO-CEN is an attempt to harmonize the different sets of standards developed by different voluntary schemes such as Fairtrade, Rainforest Alliance and UTZ but not a competition between the different standards.

Sustainability standards embrace environmental, economic and social compliance criteria. Comparing criteria defined by sustainability standards and concerns of producers in the case study countries shows that all standards address environmental concerns

but vary in the extent to which social and economic concerns are addressed (Table 7). Here, Fairtrade shows greatest coverage by actively requiring Fairtrade producers to implement development projects, which can contribute to buffer market risk and reduce dependency on a single crop and single buyers. Several standards mention prices; price premiums are stipulated under adverse market conditions by Fairtrade and generally paid for organic. However, in practice, efficiency premiums may be paid in order to ensure buyers' investments in producers' capacity building pays off (Swinnen and Vandeplas 2011).

Globally, responses by multinational corporations of the cocoa industry have focused on sustainable sourcing and in particular on certification to sustainability standards. Adherence to sustainability standards is partly (reputational) risk management but also a production differentiation strategy (Hartmann et al. 2010; Henson and Humphrey 2010). In Cameroon, buyers determine the type of certification to be applied while in Peru farmer organizations seek out certification in collaboration with buyers or on their own. In Sulawesi, cocoa producers show low interest in certification due to low financial incentives. The gradient of interest in certification reflects the gradient of potential cocoa quality required by different markets of the three case study sites as well as the gradient of establishment of farmer organizations. The newest producer nation, Peru has highest share of producer organizations with active government and NGO promotion. Cooperatives depend on external support, making financial sustainability a growing concern for the institutions that assist them. They are particularly dependent on donors, including buyers, to provide technical assistance to their members, cover staff salaries and provide financing for infrastructure expansion. Since they were founded by outside organizations without regular support during the development process, the cooperatives have yet to provide the conditions that would enable a strong sense of ownership among the members. In Peru, sustainability standards have provided a foundation for the expansion of the sector in terms of contractual arrangements between local cocoa producers associations and cocoa traders/exporters. NGOs, government agencies and international buyers have all played an important role in helping smallholders to expand their area under cocoa production, implement good production practices and comply with these voluntary standards.

The timeline of policies and development projects targeting the cocoa sector reflects the history of the sector in the countries with much earlier interventions in Cameroon and Indonesia than in Peru. In all three countries, a major focus of cocoa development policies and projects has been on increasing the level

Table 7. Producer concerns compared to sustainability standard compliance criteria.

Producer concern	Rainforest Alliance	UTZ	Organic	Fairtrade
Social				
High cost of living	–	–	–	–
Market risk	–	–	–	–
Dependence on unreliable single buyers	–	–	–	–
Shift to other crops	Maintain diverse agroforestry structure.	Diversification of agricultural production. Shade trees.	Diversity in crop production.	Contracts in line with Fairtrade requirements: agreed volumes, quality, price (Fairtrade or market price; whichever is higher), payment terms and delivery conditions. Fairtrade development plan. Diverse systems for soil fertility. Fairtrade development plan.
High risk of coca crop destruction ... (Peru)	–	–	–	–
Economic				
Declining (Peru) and low (Indonesia and Cameroon) yields	Soil fertility management	Soil fertility management. Yield optimization via access to training and inputs. Access to planting material	Species and varieties selected for adaptability to the local soil and climatic conditions and tolerance to pests and diseases.	–
Low quality	–	–	–	–
Low prices	–	Premium freely negotiated between the group and buyer Its distribution within the group is documented	Premium for organic produce (but not stipulated in standard).	Fairtrade minimum or market price whichever is higher.
Low income from cocoa compared to the past	–	–	–	–
Dependence on buyers' input and credit	–	–	–	–
High input costs	–	–	–	–
Limited access to credit	–	–	–	–
Pest and diseases	Implement integrated pest-management. Appropriate handling and application of pesticides.	Implement integrated pest-management. Appropriate handling and application of pesticides.	Species and varieties selected for adaptability to the local soil and climatic conditions and tolerance to pests and diseases.	Implement integrated pest management. Appropriate handling and application of pesticides.
Environmental				
Increased use of agrochemicals to reverse declining yields with potential negative health effects	Proper use and handling of pesticides. Choice of appropriate pesticides.	Proper use and handling of pesticides. Choice of appropriate pesticides.	No use of synthetic inputs.	Proper use and handling of pesticides and other hazardous chemicals. Choice of appropriate pesticides. Minimize hazards in the work place.
Environmental pollution	Proper use and handling of pesticides. Buffer zones.	Prevent water contamination. Reduce air contamination. Waste management.	No use of synthetic inputs. Avoid contamination and pollution.	Appropriate storage and disposal of hazardous material. Minimize use of herbicides. Manage (hazardous) waste. Maintenance of buffer zones.
Increased incidence of pests and diseases (linked to climate change and lack of application of good practices)	Implementation of integrated pest management.	Implementation of integrated pest management. Climate change adaptation.	Employ biological, cultural and mechanical mechanisms to manage pests, weeds and diseases	–
Loss of soil fertility and erosion (linked to poor management practices and limited application of inputs)	Prevention and reduction of soil erosion.	Prevention of soil erosion. Monitoring of soil fertility. Soil fertility improvement.	Soil and water conservation. Soil fertility management with manure.	Identify risks of soil erosion. Provide training to prevent and reduce soil erosion. Manage soil fertility.
Climate-related irregularity impacts on production and management calendar	–	Climate change adaptation.	–	–

Source: Compliance criteria based on SAN (2010); FLO (2011); IFOAM (2014); UTZ (2015a, 2015b)).

Table 8. Producer concerns compared to focus of policies and projects (+: concern addressed; (-): concern partially addressed; -: concern not addressed).

Producer concern	Policies			Projects		
	Indonesia	Cameroon	Peru	Indonesia	Cameroon	Peru
	Local processing Sustainable cocoa standards and certification	Sustainable cocoa standards and certification Productivity	Plantation development and expansion Climate change mitigation Investment and trade Producer organizations	Pest and disease control and IPM Sustainable production partnerships	Rehabilitation, rejuvenation, intensification Infrastructure and processing	Cocoa quality Agroforestry systems and NRM Extension services Certification
Social						
High cost of living	-	-	-	-	-	-
Market risk	-	-	(+)	-	-	-
Dependence on unreliable single buyers	-	-	-	-	-	-
Shift to other crops	(+)	(+)	(+)	(+)	(+)	(+)
High risk of coca crop destruction ... (Peru)	-	-	-	-	-	-
Economic						
Declining (Peru) and low (Indonesia and Cameroon) yields	-	+	-	+	+	(+)
Low quality	(+)	(+)	-	(+)	(+)	+
Low prices	(+)	(+)	-	-	-	(+)
Low income from cocoa compared to the past	(+)	+	-	+	+	(+)
Dependence on buyers' input and credit	-	-	-	-	-	-
High input costs	-	-	-	-	-	-
Limited access to credit	-	-	-	-	-	-
Pest and diseases	-	-	-	+	-	-
Environmental						
Increased use of agrochemicals to reverse declining yields with potential negative health effects	-	-	-	(+)	-	-
Environmental pollution	-	-	-	(+)	-	-
Increased incidence of pests and diseases (linked to climate change and lack of application of good practices)	-	-	-	(+)	-	(+)
Loss of soil fertility and erosion (linked to poor management practices and limited application of inputs)	-	-	-	-	-	-
Climate-related irregularity impacts on production and management calendar	-	-	+	-	-	(+)

of productivity (Table 8). In Peru, this is also reflected in the technological packages adopted by local producer associations (Dehu 2014) and promoted by NGOs while in the other two countries governments collaborate with the private sector and development organizations on programs to improve productivity.

Contrary to their commitment to sourcing of certified sustainable cocoa, chocolate companies show greatest presence as funder and implementing partners of development projects focusing on productivity particularly in Sulawesi, but less so in Central Cameroon, and not at all in Ucayali. In Sulawesi, these public–private partnerships are in support of establishing a globally competitive low priced (lower quality) bulk volume cocoa sector rather than improving quality and prices which would better serve farmers' interests. Farmers are autonomous and have diversified production systems out of cocoa production to the worry of their buyers. This situation illustrates interdependencies of problems and potentially conflicting solutions of different cocoa sector stakeholders confirming general observations of Black (2002) on complex webs of stakeholders, interests and regulation and the interaction thereof.

In none of the countries, nor at the global level, are these interdependencies and potentially competing interests openly addressed. The focus on cocoa productivity rather reflects a concern for sustained, i.e. a non-decreasing volume, cocoa production of cocoa buyers. Farmers are more interested in profitable (cocoa) production systems and low market risks. Recently, sustainability standards have expanded on business and development criteria. These address producers' economic concerns and can contribute to strengthening smallholders vis-à-vis other (larger) actors' stake in cocoa value chains. However, given also the recent move by retailers replacing third-party sustainability standards by company-own standards (Boland 2017; Vidal 2017), the implications for smallholder producers are not yet clear. At the global level, attention now focusses on deforestation-free cocoa supply chains, but not yet in the three local sites⁷ of the case study (GISCO 2017; Kroegeer et al. 2017).

Summary and conclusions

Cocoa is a major land use system, export crop and important source of income across the three case study countries. In areas where cocoa has been long established such as Indonesia and Cameroon, yields are decreasing due to declining soil fertility, widespread pest and disease problems, the increasing costs of agricultural inputs and farmer producers' limited access to capital and market information. In newly established areas of cocoa expansion such as

Peru, the growth in area under cocoa production has taken place at the expense of forest and associated ecosystem services loss. In all three case study countries, farmers are less concerned with cocoa productivity as cocoa production systems can be diversified with other crops. Their concerns more generally focus on low economic viability of cocoa due to low cocoa prices, high input costs and dependencies on single or a few buyers and weak or non-existent farmer organizations.

International policies define sustainable cocoa in terms of productivity within ecologically and culturally acceptable limits and acceptable working and living conditions (UNCTAD 2001, 2011). International non-governmental non-profit actors developed sustainability standards for cocoa. These initially targeted environmental (Rainforest Alliance and organic schemes), economic and social sustainability (Fairtrade, UTZ) with increasing overlap in compliance criteria over time and a recent expansion in terms of business and development criteria. Sustainability standards have been widely adopted by the private sector but have unevenly spread in Sulawesi (Indonesia), Centre Region (Cameroon) and Ucayali (Peru) with the highest presence in the latter case study site. This gradient reflects the gradient of potential cocoa quality as well as the presence of farmer organizations. Both are higher in Ucayali than in Sulawesi and Centre Region.

International commercial actors want sustainable supply of cocoa. They provide support to the producer sector as partners of development projects that focus on cocoa productivity and expansion. Similarly, government policies and programs focus on sustainable production and are implemented to benefit the cocoa sector, and less so the producers. By recently adding business and development criteria, sustainability standards have potential to address farmers concerns.

Future research needs to focus on interdependencies among economic, social and environmental goals. At the farm level, gains from specialization in cocoa production with the associated provision of ecosystem services versus the potential risks due to dependency on one single crop and a potentially limited number of buyers need to be assessed. At the value chain level, research needs to focus on the complex web of interests being served. Interventions such as access to reliable price information, support to farmer organizations and prevention of collusion amongst buyers would strengthen farmers' position vis-à-vis buyers. Further research at the value chain level needs to assess the implications of larger stakeholder coalitions: will these result in holistic solutions or do these reflect private actors' attempt to advance their own interests? At the level of interventions, future research should focus on the effects of

sequencing, such as questions of 'Productivity first?', and optimal combinations of interventions of business skill development, productivity and biodiversity enhancement.

Governments need to pay attention to diverging interests of cocoa value chain actors. They need to define clear sustainability criteria for the cocoa sector in all three sustainability dimensions and have them respected by the different actors involved. In doing so, governments need to balance the interests of the cocoa sector with those of the smallholder producers involved. Complementary to such standards policies and programs need to be put in place in general support of rural development including infrastructure, farmer organization, increased market transparency and competition amongst buyers.

Notes

1. Due to this, design and sample size of cocoa producer household surveys differ between the three countries.
2. Further information on the case study country sites is included in Box 1.
3. In June 2017, Rainforest Alliance and UTZ Certified announced their merger for late 2017 under a single certification program, the 'Rainforest Alliance standard' (Rainforest Alliance 2017).
4. For Fairtrade in coffee, de Janvry et al. (2015) show that free-entry and price premia induce higher levels of certification than can be sold.
5. The causes underlying the structural differences between the countries are related to global demand for bulk and fine-flavored cocoa, historical ties to importing countries and the respective consumer preferences, as well as the history of policy and private sector support to the development of the cocoa sectors, for example, the current Peruvian initiative in support of the expansion of fine flavored cocoa (see Table A3 of the appendix).
6. In Indonesia, yields have plummeted from 1000–1500 kg/ha to 500–700 kg/ha due to the relatively old cacao tree conditions with minimum input, maintenance and the use of low-quality planting material (ICCRI 2010).
7. At country level, Peru focuses on deforestation-free cocoa but not yet in Ucayali.

Acknowledgments

Discussions with Beria Leimona and Meine van Noordwijk contributed to the analysis of issues. We appreciate inputs from the reviewers and editors and thank Javier Montoja Zumenta for data collection in Peru. We sincerely thank the farmers, local officials and conservation/civil society stakeholders who provided information to the research team.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This research is part of the CGIAR research program on Forests, Trees and Agroforestry (FTA).

References

- Achancho V. 2012. Le rôle des organisations paysannes dans la professionnalisation de l'agriculture en Afrique subsaharienne: le cas du Cameroun. Paris: Sociologie, AgroParisTech.
- Amores F, Butler D, Ramos G, Sukha D, Espin S, Gomez A, Seguine E. 2007. Project to determine the physical, chemical and organoleptic parameters to differentiate between fine and bulk cocoa. Quito (Ecuador): Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP).
- Barjolle D, Renard O, Bernardoni P. 2013. Etude du potentiel de la commercialisation des produits agricoles des pays ACP (Afrique, Caraïbes, Pacifique) utilisant les indications géographiques et les marques avec origine. Brussels: European Commission.
- Black J. 2002. Critical reflections on regulation. London: London School of Economics and Political Sciences.
- Boland H. 2017, 07 July. MPs join calls for Sainsbury's to keep Fairtrade label. The Telegraph. <http://www.telegraph.co.uk/business/2017/07/07/mps-join-calls-sainsburys-not-axe-fairtrade-label/>.
- BPS. 2010. Estate and smallholders estates statistic data of Indonesia. http://www.bps.go.id/eng/menutab.php?tabel=1&kat=3&id_subyek=54.
- BSNI. 2016. SNI 2323:2008. Jakarta: National Standardization Agency of Indonesia.
- Callebaut B. 2016. Origin chocolate - make a journey to the world's most exciting chocolate flavors. [accessed 2016 Oct 31]. <http://www.barry-callebaut.com/origin/>.
- Capelle J. 2009. Towards a sustainable cocoa chain. Oxford: Oxfam International.
- CBI. 2014. EU buyer requirements for coffee, tea and cocoa. The Hague (The Netherlands): Centre for the Promotion of Imports from Developing Countries (CBI), Ministry of Foreign Affairs, Government of The Netherlands.
- Chesnoy J. 2015 Oct 23. Cocoa manger for ECOM Peru. Personal Interview.
- CICC. 2015. Regard synoptique de l'interprofession sur la campagne cacaoyere 2014–2015. Douala (Cameroun): Conseil Interprofessionnel du Cacao et du Café.
- Consultative Board on the World Cocoa Economy. 2014. Report of the Consultative Board on the World Cocoa Economy at its 28th Meeting CB/REP/28.
- Coulibaly N. 2012. Faire de la Cacao culture une activité rentable. Paper presented at the Conférence Mondiale du Cacao en Côte d'Ivoire, Abidjan, Côte d'Ivoire; Nov 19–23.
- CTA. 2014. New EU labelling rules could pose challenges [accessed 2015 Mar 22]. <http://agritrade.cta.int/Agriculture/Topics/Market-access/New-EU-labelling-rules-could-pose-challenges>.
- Davis SC, Boddey RM, Alves BJR, Cowie AL, George BH, Ogle SM, van Wijk MT. 2013. Management swing potential for bioenergy crops. GCB Bioenergy. 5:623–638.
- De Beenhouwer M, Aerts R, Honnay O. 2013. A global meta-analysis of the biodiversity and ecosystem service benefits of coffee and cacao agroforestry. Agric Ecosyst Environ. 175:1–7.

- de Janvry A, McIntosh C, Sadoulet E. 2015. Fair trade and free entry: can a disequilibrium market serve as a development tool? *Rev Econ Stat.* 97(3):567–573.
- de Wasseige C, de Marcken P, Bayol N, Hiol F, Mayaux Ph, Desclée B, Nasi R, Billand A, Defourny P, et Eba'a Atyi R. Eds. 2012. *Etat des forêts 2010*. Luxembourg: Office des publications de l'Union Européenne.
- Deheuvels O, Avelino J, Somarriba E, Malezieux E. 2012. Vegetation structure and productivity in cocoa-based agroforestry systems in Talamanca, Costa Rica. *Agric Ecosyst Environ.* 149:181–188.
- Dehu C. 2014. Technological packages for cocoa and oil palm: review and analysis of the technological offer in Peru. Lima (Peru): World Agroforestry Centre.
- Dewi S, van Noordwijk M, Zulkarnain MT, Dwiputra A, Hyman G, Sunderland T, Nasi R. *this issue*. Extrapolation domains for studies relating people, forests and tree crops: validity of a tropical landscapes portfolio. *Int J Biodivers Sci, Ecosyst Serv Manag.*
- DGEC. 2012. *Commodities data*: Director General of Estate Crops. Department of Agriculture, Government of Indonesia.
- Dkamela GP. 2011. The context of REDD+ in Cameroon: drivers, agents and institutions. Bogor (Indonesia): Center for International Forestry Research.
- Donovan J, Blare T, Poole N. 2017. Stuck in a rut: emerging cocoa cooperatives in Peru and the factors that influence their performance. *Int J Agric Sustain.* 15:169–184.
- DRSA. 2013. ESTUDIO DE LINEA BASE PARA EL PROYECTO MEJORAMIENTO DE CAPACIDADES TÉCNICO PRODUCTIVO DEL CACAO, MEDIANTE TRANSFERENCIA DE TECNOLOGÍA – PROVINCIA DE PADRE ABAD Y LOS DISTRITOS DE NUEVA REQUENA Y RAIMONDI DEL DEPARTAMENTO DE UCAYALI. Pucallpa (Peru): Gobierno Regional de Ucayali- Dirección Regional Sectorial de Agricultura.
- Efombagn MIB, Bieysse D, Nyassé S, Eskes AB. 2011. Selection for resistance to *Phytophthora* pod rot of cocoa (*Theobroma cacao* L.) in Cameroon: repeatability and reliability of screening tests and field observations. *Crop Prot.* 30:105–110.
- EU. 2011. Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004. Brussels: European Union.
- FAOSTAT. 2016. *Trade*. <http://faostat3.fao.org/>.
- FAOSTAT. 2017. *Crops*. <http://www.fao.org/faostat/en/#data/QC>
- Ferrero. 2010. Ferrero second corporate social responsibility report 2009/2010: sharing values to create value. Brussels: Ferrero CSR Coordination Office.
- Ferrero. 2011. Sharing values to create value. Corporate social responsibility report 2009/2010. Brussels: Ferrero CSR Coordination Office.
- FLO. 2011. Fairtrade standard for small producer organizations. Version 01. 05.2011_v1.3. Bonn: Fairtrade Labelling Organizations International.
- FLO (2017). History of fairtrade. Fairtrade labeling organization international e.V. [accessed 2017 May 12]. <https://www.fairtrade.net/about-fairtrade/history-of-fairtrade.html>.
- Fold N. 2002. Lead firms and competition in 'bi-polar' commodity chains: grinders and branders in the global cocoa-chocolate industry. *J Agr Change.* 2:228–247.
- Fold N. 2005. Global cocoa sourcing patterns. In: Fold N, Pritchard B, editors. *Cross-continental food chains*. Abingdon (UK) & New York (USA): Routledge; p. 223–238.
- Fountain AC, Hütz-Adams F. 2015. *Cocoa barometer 2015*: FNV Mondiaal, HIVOS, Solidaridad, and the VOICE Network. Tull en 't Waal, The Netherlands.
- GEM. 2015. Cocoa price. [accessed 2016 Apr 02]. <http://databank.worldbank.org/data/reports.aspx?source=Global-Economic-Monitor-%28GEM%29-Commodities#>.
- Gereffi G, Humphrey J, Sturgeon T. 2005. The governance of global value chains. *Rev Int Political Economy.* 12:78–104.
- Gilbert CL. 2009. Cocoa market liberalization in retrospect. *Rev Business Econ Lit (Rebel).* 54:294–313.
- GISCO. 2017. Deforestation-free supply chains. Berlin: German Initiative on Sustainable Cocoa. [accessed 2017 Dec 08]. <https://www.kakaoforum.de/en/our-work/challenges-in-the-cocoa-sector/deforestation-free-supply-chains/>
- Gutiérrez-Vélez VH, DeFries R, Pinedo-Vásquez M, Uriarte M, Padoch C, Baethgen W, Lim Y. 2011. High-yield oil palm expansion spares land at the expense of forests in the Peruvian Amazon. *Environ Res Lett.* 6 (044029):5pp.
- Hafid H, McKenzie F. 2012. Understanding farmer engagement in the cocoa sector in Sulawesi: a rapid assessment. Sydney: ACIAR and the University of Sydney.
- Hall DW. 1970. Handling and storage of food grain in tropical and subtropical areas. Rome: Food and Agriculture Organization of the United Nations.
- Hartmann M, Froberg K, Fischer C. 2010. Building sustainable relationships in agri-food chains: challenges from farm to retail. In: Fischer C, Hartmann M, editors. *Agri-food chain relationships*. Wallingford: CAB International; p. 25–44.
- Henson S, Humphrey J. 2010. Understanding the complexities of private standards in global agri-food chains as they impact developing countries. *J Dev Stud.* 46:1628–1646.
- Hershey's. 2012. Hershey's 21st century cocoa sustainability strategy. The Hershey Company, Hershey, Pennsylvania.
- ICCO. 2012. Abidjan cocoa declaration, World Cocoa Conference 2012. [accessed 2017 May 05]. https://www.icco.org/about-us/international-cocoa-agreements/doc_download/296-abidjan-cocoa-declaration.html.
- ICCO. 2014a. Cocoa year in Cameroon 2013/2014. *Q Bull Cocoa Stat.* XL(1), 64p.
- ICCO. 2014b. ICCO and UNFSS partner on 2nd international cocoa certification workshop. [accessed 2016 Mar 19]. <http://unfss.org/2014/03/28/icco-and-unfss-partner-on-2nd-international-cocoa-certification-workshop/>.
- ICCO. 2015. ICCO-ITC seminar on voluntary sustainability standards to take place 24 March in Abidjan. [accessed 2015 Mar 03]. <http://www.icco.org/about-us/icco-news/276-icco-itc-seminar-on-voluntary-sustainability-standard-to-take-place-24-march-in-abidjan.html>.
- ICCRI. 2010. *Buku Pintar Budidaya Kakao*. Jakarta: AgroMedia Pustaka. Indonesian Coffee and Cacao Research Institute.
- IFOAM. 2014. The IFOAM NORMS for organic production and processing version 2014. Bonn (Germany):

- International Federation of Organic Agriculture Movements.
- IFOAM. 2017. History. International Foundation for Organic Agriculture. [accessed 2017 May 12]. <https://www.ifoam.bio/en/about-us/history>.
- IITA. 2002. Child labor in the cocoa sector of West Africa. A synthesis of findings in Cameroon, Côte d'Ivoire, Ghana, and Nigeria. Ibadan (Nigeria): Sustainable Tree Crops Program (STCP), International Institute of Tropical Agriculture, under the auspices of USAID/USDOL/ILO.
- INEI. 2012. IV Censo Nacional Agropecuario 2012. Lima (Peru): Instituto Nacional de Estadística e Informática.
- Insight Alpha. 2012. Industry overview: Indonesia cocoa industry. [accessed 2016 Jan 03]. http://insightalpha.com/news_details.php?cid=82&sid=72&nid=211.
- ISEAL. 2011. Proposal to elaborate a new CEN standard on "traceable and sustainable cocoa" as put forward by the Danish Standards Foundation on 29-07-2011. [accessed May 30]. http://www.isealalliance.org/sites/default/files/ISEAL_Cocoa_CEN_submisison_Nov2011.pdf.
- ISEAL. 2016. The Global Living Wage Coalition brings together six of the world's most influential sustainability standards to improve wage levels in certified supply chain. [accessed 2016 May 25]. <http://www.isealalliance.org/our-work/improving-effectiveness/global-living-wage-coalition>.
- ITC. 2015. Trade map. Geneva (Switzerland): International Trade Centre based on UN COMTRADE.
- Janudianto K, Isnurdiansyah N, Suyanto S, Roshetko JM. 2012. Agroforestry and forestry in Sulawesi series: livelihood strategies and land use system dynamics in Southeast Sulawesi. Bogor (Indonesia): World Agroforestry Centre.
- Janudianto R, Mahrizal JM. 2014. Cocoa Agroforestry System (CAS) improving productivity and profitability of smallholder cacao in Sulawesi. Bogor, Indonesia. Paper presented at the World Agroforestry Congress; Feb 9-14; India.
- Kaplinsky R. 2004. Competitions policy and the global coffee and cocoa value chains. Brighton: Institute of Development Studies, University of Sussex, and Centre for Research in Innovation Management, University of Brighton.
- Khususiyah N, Janudianto I, Suyanto S, Roshetko JM. 2012. Agroforestry and forestry in Sulawesi series: livelihood strategies and land use system dynamics in South Sulawesi. Bogor (Indonesia): World Agroforestry Centre.
- Krauss U, Soberanis W. 2001. Rehabilitation of diseased cacao fields in Peru through shade regulation and timing of biocontrol measures. *Agrofor Syst.* 53:179–184.
- Kroeger A, Bakhtary H, Haupt F, Streck C. 2017. Eliminating deforestation from the cocoa supply chain. Washington (DC): The World Bank.
- Lambin EF, Meyfroidt P. 2011. Global land use change, economic globalization, and the looming land scarcity. *Proc Natl Acad Sci.* 108:3465–3472.
- Losch B. 2002. Global restructuring and liberalization: Côte d'Ivoire and the end of the international cocoa market? *J Agr Change.* 2:206–227.
- Magne A, Nonga N, Yemefack M, Robiglio V. 2014. Profitability and implications of cocoa intensification on carbon emissions in southern Cameroun. *Agrofor Syst.* 88:1133–1142.
- Mars. 2014. History timeline. [accessed 2014 Jul 15]. <http://www.mars.com/global/about-mars/history.aspx>.
- Mars. 2016. Out cocoa policy. Working with cocoa farmers for a sustainable future. [accessed 2016 Oct 31]. www.mars.com/global/about-us/policies-and-practices/cocoa-policy.
- Mbondji P. 2010. Le cacaoyer au Cameroun. Yaoundé: Presse de l'université catholique d'Afrique Centrale.
- Milder JC, Arbuthnot M, Blackman A, Brooks SE, Giovannucci D, Gross L, Zrust M. 2015. An agenda for assessing and improving conservation impacts of sustainability standards in tropical agriculture. *Conserv Biol.* 29:309–320.
- MINADER. 2010. Annuaire des Statistiques du Secteur Agricole Campagnes 2007 & 2008. Yaunde: Agri-Stat Cameroun.
- MINAGRI. 2014. Alineamiento Estratégico de la Cadena de Cacao y Chocolate. Ministry of Agriculture, Lima (Peru).
- MINAGRI-SERFOR. 2014. iNAMazonia Nationally Appropriate mitigation Actions (NAMA) in the Cacao Sector of the Peruvian Amazon Region.
- MINAM. 2015. Estrategia Nacional Sobre Bosques y Cambio Climático. Edición Preliminar. Decreto Supremo 007-2016-MINAM. Lima: Ministerio de Ambiente de Perú.
- Mithöfer D, van Noordwijk M, Leimona B, Cerutti PO. 2017. Certify and shift blame, or resolve issues? Environmentally and socially responsible global trade and production of timber and tree crops. *Int J Biodivers Sci, Ecosyst Serv Manag.* 13(1):72–85.
- Mondelez International. 2014. Mondelez international takes steps to advance women's rights in cocoa farming. [accessed 2016 Oct 31]. <http://ir.mondelezinternational.com/releasedetail.cfm?releaseid=845154>.
- NCCB. 2014. Cocoa Statistics. Douala (Cameroon): National Cocoa and Coffee Board.
- Ndoumbe-Nkeng M, Cilas C, Nyemb E, Nyasse S, Bieysse D, Flori A, Sache I. 2004. Impact of removing diseased pods on cocoa black pod caused by *Phytophthora megakarya* and on cocoa production in Cameroon. *Crop Prot.* 23:415–424.
- Neilson J, Palinrungi R, Muhammad H, Fauziah K. 2011. ACIAR Cocoa technical report. Securing Indonesia's cocoa future: farmer adoption of sustainable farm practices on the island of Sulawesi Canberra: Australian Centre for International Agricultural Research (ACIAR).
- Nestlé. 2013. Nestlé action plan on women in the cocoa supply chain. [accessed 2014 May 05]. <http://www.nestle.com/asset-library/documents/creating-shared-value/responsible-sourcing/action-plan-women-in-cocoa-supply-chain.pdf>.
- Nestlé. 2016. Nestlé's work with women farmers in its supply chain. [accessed 2016 Oct 31]. <http://www.nestle.com/csv/what-is-csv/women-empowerment/farmers>.
- Nieburg O. 2013a. Barry Callebaut talks customization, certification and Petra Foods. *Confectionary News.* <https://www.confectionarynews.com/Article/2013/02/13/Barry-Callebaut-trends-certification-and-Petra-Foods>.
- Nieburg O. 2013b. Chocolate to evolve like wine: aromatics the future for premium sector – CEMOI RD chief. *Confectionarynews.* <http://www.confectionarynews.com/R-D/Chocolate-to-evolve-like-wine-Aromatics-the-future-for-premium-sector-Cemoi-R-D-chief>.
- Nieburg O. 2014. Country of origin labelling for cocoa 'meaningless' and would up costs for consumers, says ECA. *Confectionarynews.* <http://www.confectionarynews.com/Regulation-Safety/Country-of-origin-labeling-for-cocoa-meaningless>.
- Oxfam. 2013. Women and chocolate: an action roadmap. [accessed 2016 Oct 31]. <http://www.behindthebrands.org/en/campaign-news/women-cocoa-roadmap>.

- Parkin B. 2016. Mars chocolate signs UN women's empowerment principles. [accessed 2016 Oct 31]. <http://cocoa.sustainability.com/2013/04/mars-chocolate-signs-un-womens-empowerment-principles/>.
- Pay E. 2009. The market for organic and fair-trade cocoa. Rome: Food and Agriculture Organization of the United Nations.
- Perdana A, Roshetko JM. 2012. Agroforestry and forestry in Sulawesi series: rapid market appraisal of agricultural, plantation and forestry commodities in South and Southeast Sulawesi. Bogor (Indonesia): World Agroforestry Centre.
- Ponte S. 2002. The 'Latte revolution'? Regulation, markets and consumption in the global coffee chain. *World Dev.* 30:1099–1122.
- Ponte S, & Sturgeon T. 2013. Explaining governance in global value chains: a modular theory-building effort. *Review Of International Political Economy.* 21(1):195–223.
- Potts J, Lynch M, Wilkings A, Huppé G, Cunningham M, Voora V. 2014. The state of sustainability initiatives review 2014: standards and the green economy. Winnipeg, Manitoba (Canada): International Institute for Sustainable Development (IISD) & London (UK): International Institute for Environment and Development (IIED).
- Potts J, van der Meer J, Daitchman J. 2010. The state of sustainability initiatives review 2010: sustainability and transparency. Winnipeg (Manitoba, Canada) & London (UK): International Institute for Sustainable Development (IISD) & International Institute for Environment and Development (IIED).
- Rahmanulloh A, Sofiyuddin M, Suyanto S. 2012. Agroforestry and forestry in Sulawesi series: profitability and land-use systems in South and Southeast Sulawesi. Bogor (Indonesia): World Agroforestry Centre.
- Rainforest Alliance. 2017. The rainforest alliance and UTZ to merge, forming new, stronger organization. Rainforest alliance. [accessed 2017 Dec 10]. <https://www.rainforest-alliance.org/articles/rainforest-alliance-utz-merger>.
- Roshetko JM. 2001. Agroforestry species and technologies: a compilation of the highlights and factsheets published by NFTA and FACT Net 1985–1999. Morrilton (Arkansas (USA)): Taiwan Forestry Research Institute and Council of Agriculture, Taiwan, Republic of China and Winrock International.
- Roshetko JM, Lasco RD, Delos Angeles MD. 2007. Smallholder agroforestry systems for carbon storage. *Mitigation Adaptation Strategies Global Change.* 12:219–242.
- Ruf F. 1995. Chapter 1 – from forest rent to tree-capital: basic “laws” of cocoa supply *cocoa cycles*. Cambridge (UK): Woodhead Publishing; p. 1–53.
- Sackett M. 2008. Forced child labor and cocoa production in West Africa. *Topical Research Digest: Human Rights and Contemporary Slavery*. Denver (CO, USA): University of Denver; 84–99. <http://www.du.edu/korbel/hrhw/researchdigest/slavery/africa.pdf>
- SAN. 2010. Sustainable agriculture standard. Version 4. New York (London): Sustainable Agriculture Network.
- SAN. 2017. Our history. Sustainable agriculture network. [accessed 2017 May 12]. <http://san.ag/web/about-us/our-history-2/>.
- Schroth G, Harvey CA. 2007. Biodiversity conservation in cocoa production landscapes: an overview. *Biodivers Conserv.* 16:2237–2244.
- Schroth G, Harvey CA, Vincent G. 2004. Complex agroforests: their structure, diversity, and potential role in landscape conservation. Washington (DC): Agroforestry and biodiversity conservation in tropical landscapes. Island Press; p. 227–260.
- Schroth G, Läderach P, Martinez-Valle AI, Bunn C, Jassogne L. 2016. Vulnerability to climate change of cocoa in West Africa: patterns, opportunities and limits to adaptation. *Sci Total Environ.* 556:231–241.
- Silva C, Robiglio V, Donovan J. 2015. Un Enfoque de Paisaje a los Esquemas REDD+: la Experiencia de Reducir Emisiones en Distintos Usos de la Tierra con Productores de Cacao en el Amazonia Peruano. In: Montagnini F, Somarriba E, Murgueitio H, Fassola EB, editors. *Sistemas Agroforestales: Funciones Productivas, Socioeconómicas y Ambientales*. Turrialba (Costa Rica): CAITE.
- Smiley GL, Kroschel J. 2008. Temporal change in carbon stocks of cocoa-gliricidia agroforest in Central Sulawesi, Indonesia. *Agrofor Syst.* 73:219–231.
- Somarriba E, Cerda R, Orozco L, Cifuentes M, Dávila H, Espin T, Deheuvels O. 2013. Carbon stocks and cocoa yields in agroforestry systems of Central America. *Agric Ecosyst Environ.* 173:46–57.
- Sonwa DJ, Nkongmeneck BA, Weise SF, Tchatat M, Adesina AA, Janssens MJJ. 2007. Diversity of plants in cocoa agroforests in the humid forest zone of Southern Cameroon. *Biodivers Conserv.* 16:2385–2400.
- Steijn J. 2012. The CEN initiative on sustainable and traceable cocoa. Paper presented at the The World Cocoa Conference; Abidjan, Cote d'Ivoire. http://www.icco.org/about-us/international-cocoa-agreements/doc_download/424-351-jack-steijn.html.html.
- Supriatna Y, Taylor M. 2014. Indonesia's cocoa grinding capacity to soar as output lags -industry groups. Reuters. <http://www.reuters.com/article/2014/04/03/indoensia-cocoa-idUSL4N0MV2IT20140403>.
- Swinnen J, Vandeplas A. 2011. Rich consumers and poor producers: quality and rent distribution in global value chains. *J Globalization Dev.* 2(2):2.
- Swinnen JFM, Maertens M. 2007. Globalization, privatization, and vertical coordination in food value chains in developing and transition countries. *Agric Econ.* 37:89–102.
- Sys C, Van Ranst E, Debaveye J. 1993. Land evaluation. Part 3: crop requirements. Brussels (Belgium): General Administration of Development Cooperation of Belgium.
- Tegegne YT, Lindner M, Fobissie K, Kanninen M. 2016. Evolution of drivers of deforestation and forest degradation in the Congo Basin forests: exploring possible policy options to address forest loss. *Land Use Policy.* 51:312–324.
- Tomich TP, Chomitz K, Francisco H, Izac A-MN, Murdiyarso D, Ratner BD, van Noordwijk M. 2004. Policy analysis and environmental problems at different scales: asking the right questions. *Agric Ecosyst Environ.* 104:5–18.
- Tondoh JE, Kouamé FNG, Martinez Guéi A, Sey B, Wowo Koné A, Gnessougou N. 2015. Ecological changes induced by full-sun cocoa farming in Côte d'Ivoire. *Global Ecol Conserv.* 3:575–595.
- Tscharntke T., Clough Y., Bhagwat S. A., Buchori D., Faust H., Hertel D., & Wanger T. C.(2011). Multifunctional shade-tree management in tropical agroforestry landscapes – a review. *Journal of Applied Ecology.* 48(3):619–629.
- UN Women. 2016. Women's empowerment principles. [accessed 2016 Oct 31]. <http://weprinciples.org/site/principlesoverview/>.
- UNCTAD. 2001. International Cocoa Agreement 2001. United Nations Conference on Trade and

- Development. <http://www.icco.org/about-us/international-cocoa-agreements.html>.
- UNCTAD. 2011. International Cocoa Agreement 2010. Geneva: United National Conference on Trade and Development.
- UNCTAD. 2013. Forum to discuss voluntary sustainability standards that increasingly affect developing country exports. Conference marks effort by UN agencies to have coordinated approach on important tool for sustainable trade and development [Press release]. https://unfss.files.wordpress.com/2012/06/pr13003_en_unfss.pdf.
- United Nations. 1993. International Cocoa Agreement 1993. <http://www.icco.org/about-us/international-cocoa-agreements.html>.
- UTZ. 2015a. Code of conduct, cocoa module version 1.1. Amsterdam: UTZ Certified.
- UTZ. 2015b. Core code of conduct: for group and multi-group certification. Version 1.1. Amsterdam: UTZ Certified.
- UTZ. 2017. About UTZ. [accessed 2017 May 12]. <https://utz.org/who-we-are/about-utz/>.
- van der Kooij S. 2013. Market study of fine flavour cocoa in 11 selected countries – revised version. Amsterdam: Royal Tropical Institute, KIT Development Policy & Practice.
- VECO. 2011. Increased incomes for Indonesian cocoa farmers in sustainable markets: NGO-private sector cooperation on Sulawesi island. Leuven: Veco.
- Vidal J. 2017 Jun 27. Move by UK supermarkets threatens to bring Fairtrade crashing down. The Guardian. <https://www.theguardian.com/global-development/2017/jun/24/fair-trade-crashing-down-sainsburys-tesco-tea-growers-nairobi>
- Wade ASI, Asase A, Hadley P, Mason J, Ofori-Frimpong K, Preece D, Norris K. 2010. Management strategies for maximizing carbon storage and tree species diversity in cocoa-growing landscapes. *Agric Ecosyst Environ.* 138:324–334.
- Wau D. 2015. Small-scale cocoa farmer participation in certification: an examination of enabling conditions in Indonesia [M Phil thesis]. Birmingham (UK): University of Birmingham.
- Wessel M, Quist-Wessel PMF. 2015. Cocoa production in West Africa, a review and analysis of recent developments. *NJAS - Wageningen J Life Sci.* 74–75:1–7.
- World Cocoa Foundation. 2014. Global chocolate and cocoa companies announce unprecedented sustainability strategy in Côte d'Ivoire. [accessed 2014 Jul 15]. http://worldcocoafoundation.org/wp-content/uploads/FINAL-CocoaAction-CDI-Press-Release-English_05202014.pdf.
- Yin RK. 2012. Applications of case study research. Los Angeles: SAGE Publications, Inc.
- Zuidema PA, Leffelaar PA, Gerritsma W, Mommer L, Anten NPR. 2005. A physiological production model for cocoa (*Theobroma cacao*): model presentation, validation and application. *Agric Syst.* 84:195–225.

Table A1. Timeline of policy frameworks and projects safeguarding economic, environmental and social sustainability in Indonesian cocoa.

Year	Policies, content and degree of enforcement	Projects
1970s		
1980s	Rehabilitation and expansion of export crops: primarily in Sulawesi, led to the expansion of cocoa cultivation.	Commercial cocoa project
1990s	Plantation development in special areas: endorsed the expansion of cocoa cultivation, encouraged smallholder production. PP No. 2 foreign capital investment for export and import: improved market incentives for producers, permitted direct purchase by foreign companies. Ministry of Industry and Trade Regulation No. 11/MPP/SK/I/1996 on foreign investment on export: support and facilitate PP No 2.	Commercial cocoa project Integrated cocoa management project
2000s	National certification standards for cocoa quality 86/KEP/BSN/9/2008: not implemented because (1) huge number of value chain actors; (2) demand exceeds supply; (3) prices fluctuate frequently and market information is not readily available.	Sustainable cocoa extension services for smallholders
		The pest reduction and integrated management project Program for eastern Indonesia small and medium enterprises Cocoa sustainability partnership Agribusiness market and support activity Mars Cocoa Development Centre National Program on Cocoa Improvement of Production and Quality: reverse the decline of cocoa productivity and quality by rejuvenation, rehabilitation and intensification of 450,000 ha of cocoa. Results in expansion of cocoa.
2010s	Progressive export tax, Financial Ministry Regulation No. 67: strengthen the national cocoa industry and sourcing of raw material from domestic production. National indicators for sustainable cocoa certification: not yet adopted. Received strong support and coordination from private and public sectors to sustain cocoa production, strengthen the cocoa industry and sustain environmental resources.	Sustainable Cocoa Production Program Sanitary and phytosanitary capacity building and knowledge sharing program
		Green prosperity – Sustainable Cocoa Production Program Cocoa Life

Source: Wau (2015).

Table A2. Timeline of policy frameworks and projects safeguarding economic, environmental and social sustainability in Cameroonian cocoa.

Year	Policies, content & degree of enforcement	Projects
1950s	Decret no. 58–101 (13.09.1958): law on cocoa quality	
1990	Collapse of the Cameroon main marketing board Launch of National Cocoa and Coffee Board: inspect & certify quality, collect production, trade and consumption statistics, represent Cameroon at the ICCO Supporting laws: limit the influence of illegal buyers Creation of the National Cocoa and Coffee Board and the Interprofessional Council of Cocoa and Coffee: Finance production and marketing, price stabilization, cooperatives now have independent private association status Decret no. 58–101 revised: quality standards control revised, period of validity of the bulletins of verification increased to 20 days Laws related to cooperatives: enable producers to organize themselves, increase producers' power in price negotiation Creation of Cameroon Cocoa Development Society: revitalization and restoration of the cocoa sector via high-quality planting material, opening up of large-scale production, reduction of post-harvest losses Decree regulating the packaging and marketing of cocoa beans: packaging and marketing of cocoa beans New laws and degree for cocoa quality: rational use of pesticides Creation of Development Fund for Cocoa and Coffee FODECC: financing and marketing of cocoa and products	Sustainable Tree Crops Program (STCP): productivity, marketing and diversification of income Project to support the use of fertilizers on cocoa/coffee Multi-focused nurseries and demonstration plots or farmer field schools Professionalization strengthening agricultural and institutions stimulus program to attract local investors Acquisition of land in the central region to facilitate the availability of planting materials Project for the protection of cocoa and coffee orchards Cocoa and coffee seedlings project Project to support the production and dissemination of improved plant material Project to support the integration of young farmers and foster the emergence of agricultural development centers in areas with high production potential Project of support to the production and dissemination of improved plant material cocoa/coffee Emergency program to reduce pesticides in cocoa and coffee in Cameroon Pilot program of reliance for cocoa/coffee/cotton to improve living conditions of producers Information system of cocoa and coffee sectors in Cameroon: data base and price information Support program for improving agricultural productivity/strengthen chains: availability of improved planting material Infrastructure construction of rural roads for cocoa transportation and others crops Rejuvenate and improve cocoa plantations for better cocoa quality and high yields Project of rehabilitation of solar driers Agropole: support producers, processing, infrastructure CICC program New Generation: creation of 500 ha of cocoa plantation
2000s		
2010s	OHADA Uniform Act on Cooperatives: facilitate business development Growth and employment strategy: improve production by introducing high-yield varieties, provide technical, financial and institutional support to producers ISO/CEN standards: support the development of a sustainable cocoa economy, implemented nationally	

Table A3. Timeline of policy frameworks safeguarding economic, environmental and social sustainability in Peruvian cocoa and projects to promote cocoa expansion in Ucayali, Peru.

1990s and 2000s	Policies, content & degree of enforcement	Projects
	<p data-bbox="778 969 826 2011">2010s Strategic Plan Multiannual for the Agricultural Sector (2012–2016); prioritizes cocoa as being of strategic importance to Peru, which allowed the Ministry of Agriculture to focus on promoting cocoa and invest more heavily in the sector</p> <p data-bbox="850 969 898 2011">Regional Ordinance No. 006–2012-GRU/CR: recognizes cocoa as an emblematic product of the department of Ucayali which allowed the regional government to develop new projects and invest more in the cocoa sector</p> <p data-bbox="906 969 954 2011">National Law that promotes the creation of agricultural cooperatives (2013, Law No. 29972): encourages farmers' organizations to become formal farmers' cooperatives by providing substantial tax benefits to cooperatives</p> <p data-bbox="962 969 1040 2011">Nationally Appropriate Mitigation Action: Peru committed to the global REDD+ agenda to reduce deforestation to zero by 2021 and in its INDCs in 2016 presented activities related to mitigation through good practices in cocoa production in line with a concept idea for a NAMA on cocoa presented by the minister of agriculture at COP 20 in 2015 (Minagri 2014, MINAGRI-SERFOR 2014).</p>	<p data-bbox="611 141 659 958">Alternative Development in the Aguaytía Basin: providing extension services; strengthening of producer organizations (1998–2012)</p> <p data-bbox="683 141 730 958">Natural resources management in the Peruvian Amazon: enrichment of cocoa plantations with forest species (2008–2009)</p> <p data-bbox="738 141 786 958">Strengthening capabilities for cocoa quality improvement: infrastructure; training in cocoa post-harvest; technical advice (2008–2009)</p> <p data-bbox="794 141 850 958">Promotion of Agroforestry Systems based on fine-flavored cocoa for local development and the conservation of natural resources in the Peruvian humid tropics: providing fine-flavored cocoa saplings; infrastructure; technical advice (2010–2012)</p> <p data-bbox="898 141 994 958">Improvement of cocoa production, through UTZ, Fairtrade and Organic certifications in San Alejandro, Irazola, Ucayali: training in the certification process; technical advice (2013–2015)</p> <p data-bbox="962 141 994 958">Peru Cocoa Alliance (Strengthening the value chain for fine-flavored cocoa in Peru): providing fine-flavored cocoa saplings; infrastructure; technical advice (2012–2015)</p>