Services to support cocoa sector competitiveness and sustainability: a case study from Indonesia

Sustainable Cocoa Production Program Case Study Series: No. 2

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EXECUTIVE SUMMARY

A challenge facing initiatives to promote more sustainable, competitive, and resilient agricultural systems is to identify solutions that are not only effective, but which can (a) be feasibly adopted by smallholder farmers and market actors, and (b) remain available when development assistance comes to an end.

This case study examines the experience of the Sustainable Cocoa Production Program (SCPP), which worked through a public-private development partnership (PPDP) to improve production and build sustainable supply chains in Indonesia's cocoa industry as it faced global and domestic challenges. Seven development organisations and eleven private cocoa buyers contributed approximately USD 55m to the PPDP. SECO and Swisscontact were, respectively, the 'lynchpin' funder and implementing organisation throughout.

SCPP focused on establishing, strengthening, and sustaining four key market functions: farmer training, traceability, planting material, and finance. It trained 160,000 farmers, enabled the integration of 79,000 cocoa farmers into sustainable, certified supply chains, generating USD 927,000 of certification premiums, and increased smallholder yields by 52% and raised their incomes by 75%. These tangible results demonstrated that the model of training plus certification plus traceability promoted could upgrade conventional cocoa supply chains to traceable, certified supply chains. In turn, this triggered sector-wide changes that indicate growing sector maturity:

- Investment in farmer training as a core business function, not a Corporate Social Responsibility (CSR). Cocoa firms have integrated farmer support into the core commercial functions of their procurement or sourcing departments, as opposed to running them separately under sustainability or CSR departments.
- Cocoa sector stakeholders are developing their own training programmes based on the content developed by SCPP, including cocoa firms and the Ministry of Agriculture.
- Traceability services developed are being offered commercially to various clients the in cocoa, palm oil, coffee, coconut, and rubber sectors in more than 15 countries. Other firms have developed their own, in-house traceability platform and established or expanded their field teams.
- A commercial supply of high-quality planting materials is available, and top and side grafting are a new norm in good cocoa farming practices in Indonesia.

SCPP's experience in establishing and strengthening market functions to make Indonesia's cocoa sector more sustainable, competitive, and resilient has highlighted several lessons that might be more widely applicable agricultural development initiatives. These lessons relate to the role of development organisations, the importance of doing the right type of analysis, and focusing on function before form.

Role of development organisations: provide or facilitate?

- Direct delivery can be a valid tactic, but it must be guided by a vision for sustainability
- Ensure feasibility for commercial delivery within prevailing capacity and affordability
- Build on what's already there

Do the right kind of analyses:

- Start with a feasibility analysis and revisit it regularly
- Perform cost-benefit analyses for the adoption of recommended practices

Form follows function:

- Organised collective actions are not a panacea for farmer problems
- Focus on market actors with the strongest incentive and capacity to perform the function
- Size does matter for resilience against market shocks
- Be mindful of the differences between programme MRM (monitoring and results measurement) and MIS (management information system) needed by market actors

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INTRODUCTION

About SCPP

The Sustainable Cocoa Production Program (SCPP) aimed to increase the income of smallholder cocoa farmers by improving the competitiveness of the cocoa sector. It focused on improving production (i.e. farming good practices and technology transfer), sustainable supply chain (i.e. certification, traceability, supply chain management and market access), and sector-wide collaboration and knowledge sharing. Implemented by Swisscontact, SCPP commenced in 2012 and operated as a public-private development partnership[1]. SCPP managed a total of USD 55m, comprising contributions from seven development organisations (USD 43m) and eleven private cocoa buyers (USD 13m), making it one of the largest partnerships between donors and businesses in the commodity sector.

SCPP worked to establish and strengthen four main market functions:

- Farmer training
- Traceability
- Planting material
- Finance

This case study examines why and how SCPP supported the development of these functions and captures lessons from eight years of programme implementation that might guide future interventions in commodity sector development.

Overview

Initial sector context

SCPP began in the context of global shortages of cocoa. International cocoa firms were under pressure to secure existing and find additional sources of supply to fill the gap. In Indonesia, cocoa production was shrinking despite expanding cocoa cultivation by smallholder farmers, signifying a problem of declining yields among smallholder producers.

Cocoa productivity was 300-400kg/ha, **far below the recommended commercially viable level** of 1,000kg/ha. Deteriorating yields and quality were caused by ageing trees, pests and diseases, and inferior farming practices. The average age of cocoa trees was estimated to be over 18 years, surpassing the peak productive period of 8 to 12 years. Around 15-20% were unproductive. Cocoa Pod Borer (CPB), Vascular-Streak Dieback (VSD) and black pod infestation plagued many cocoa farms. Inadequate farmer knowledge of good agricultural practices (GAP) was identified as the underlying problem.

Growing pressure for sustainable and traceable cocoa

International cocoa firms were facing growing demand for sustainable production, responsible sourcing practices and traceable supply chains. Food and beverage manufacturers needed to provide information to consumers about the cocoa they used: how cocoa beans were cultivated, harvested, handled, and processed and who was involved in the supply chain.

Voluntary sustainability standards (VSS), e.g. Rainforest Alliance (RA) and UTZ, had been established to help the industry meet sustainability and traceability goals. Independent audits by authorised certification bodies assure consumers that industry actors meet these standards. However, these

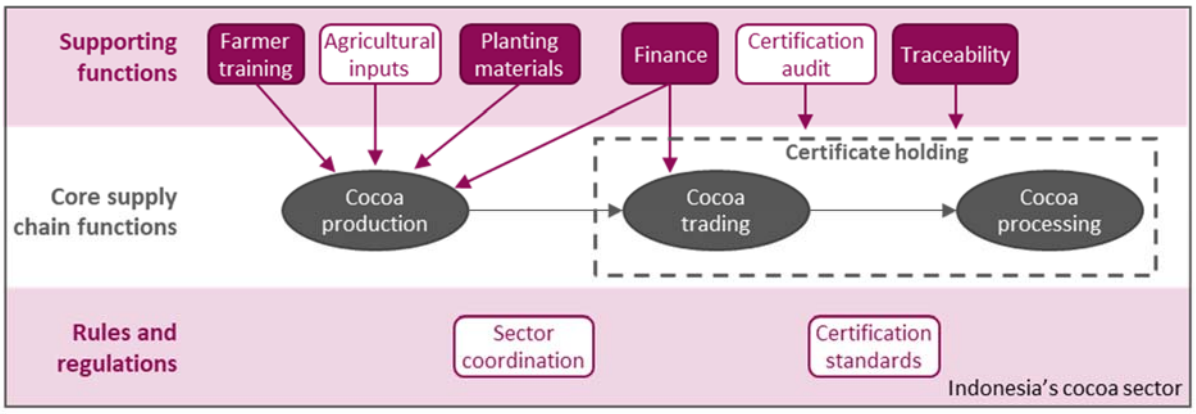
[1] For further detail on public-private development partnerships, see Springfield Centre (2021a).

standards were not yet rolled out in Indonesia's cocoa sector. Establishing traceability and certification standards across Indonesia was a daunting task.

Actors in the cocoa supply chain, especially smallholders, were largely unaware or capable of complying with sustainability standards. Operationalising traceability requires an integrated platform for data recording, management, and reporting accessible to actors across the supply chain. Such a platform did not exist when SCPP started in 2012. The incentives to comply with standards were uncertain. For consumer-facing cocoa firms, the market pressure was evident, but for other actors, the threats and benefits were not well understood. High prices caused by the cocoa supply gap meant that producers and traders were not under any pressure to change practices or performance.

Indonesia's cocoa supply chain

Figure 1 An overview of the traceable, certified cocoa supply chain and supporting functions and rules



Cocoa production was dominated by smallholder farmers (1.0-1.5ha cultivation area, 700-800 trees/ha). Most followed a low-input low-yield production model. Cocoa was not their only source of income; many farmers grew other crops or worked in other jobs. The average age of farmers was about 45 years old and typically they were educated to a primary or junior secondary level. Around 80%-90% of farmers are male, but their families were also involved in cocoa cultivation.

Cocoa trading comprised a chain of traders involving village collectors, small district-level traders and larger regional traders, most of which traded in multiple commodities. Traders also performed aggregation, sorting, transportation, storage, and financing functions. There were few cocoa producer groups or cooperatives active in trading prior to SCPP's intervention.

Cocoa processing was conducted by domestic or international manufacturers of chocolate products or cocoa processing factories selling intermediary products to export markets.

A key function of traders and buyers – of various types, including international cocoa product manufacturers, multinational commodity traders, local traders, and cooperatives – was envisaged to be **certificate holders (CHs).** CHs administer the documentation needed for the certification process and ensure the compliance of their traders and farmers with certification control points.

The rationale for SCPP's intervention

To address the sector constraints described above, SCPP developed and strengthened priority functions (see highlighted boxes in Figure 1): farmer training, traceability services, planting material, and financial services. Input provision and sector coordination were also addressed as supplementary

activities. Certification standards and certification audit services did not require any intervention, as they were already established and were being delivered by market actors.

Farmer training had two objectives, to improve cocoa yield and quality and ensure farmers could comply with certification requirements. Weak knowledge about good agricultural practices (GAP) was identified as the primary cause of inferior farming performance. SCPP's predecessor, PEKA (Cocoa Economic Development in Aceh, 2010-2012), had demonstrated that improving farmers' GAP can rapidly increase cocoa quality and yield. PEKA measured the productivity of over 1,100 cocoa farmers before and after its training and recorded an average increase in yield of 124%, from approximately 300kg/ha to 700kg/ha. Since certification was new to Indonesia's cocoa sector, farmers also needed to learn about certification requirements and required technical guidance to comply with the certification process.

SCPP did not intervene in **agricultural inputs** because many small retailers in rural areas already sold agricultural inputs to cocoa farmers. Instead, SCPP addressed the proper use of fertilisers and pesticides through its GAP training. Fertiliser application practices amongst cocoa farmers were far from optimum. Based on PEKA's 2010 baseline data, on average, cocoa farmers used 49kg of fertiliser per hectare to derive an annual yield of 254kg/ha. Farmers had limited knowledge of the different nutrients and types of fertilisers required by cocoa trees or efficient application methods. Almost none used organic fertilisers or fertilisers explicitly formulated for cocoa. Most used subsidised fertilisers intended for rice: single-nutrient fertilisers like urea, KCl (potassium chloride) and TSP (Triple Super Phosphate). Years of urea application had caused the acidification of soils, increasing susceptibility to disease and reducing yields. Pesticide use was widespread but often inappropriate. Most farmers did not follow recommended practices (pruning, sanitation, frequent harvesting) to make pesticides effective. They were unaware of the active ingredients and safety requirements of the products they used, including those banned or on the watchlist of certification bodies. Farmers typically did not use protective clothing while spraying or safely handle and store pesticides, causing health issues.

Traceability provides evidence that cocoa beans were produced, handled, and traded according to the standards – a prerequisite for certification. This enabled international cocoa buyers to respond to their consumers' demands. In turn, certification triggers premium payments, which provide farmers with incentives to comply with certification standards and cover the costs of certification. Traceability services did not exist in Indonesia's cocoa sector prior to SCPP's intervention.

Yield has a direct correlation with tree age. The average age of cocoa trees in Indonesia was estimated to be over 18 years, and around 15-20% of trees were unproductive, damaged by pests and diseases. However, quality **planting materials** were not widely available. Seedlings were typically raised from locally harvested seeds and had inferior genetic traits, resulting in low yields and susceptibility to pests and diseases. A nationwide government replanting effort failed because it did not sufficiently involve cocoa sector stakeholders. Seedlings flown from Java into cocoa-producing provinces did not survive in new environments.

Farmers needed working capital to purchase planting materials, inputs and equipment and pay for additional labour to rehabilitate farms. However, appropriate and affordable **finance** was generally not widely available to cocoa smallholders.

SCPP assisted existing cocoa sector platforms at the national and international level in their **sector coordination** function. For example, SCPP provided CSP (Cocoa Sustainability Partnership) with technical inputs to expand its Sustainability Roadmap to 2030. SCPP also provided technical support

to CSP and PISAgro (Partnership for Indonesia Sustainable Agriculture) to advocate for government support in promoting innovation on cocoa-specific fertiliser (see Box 1).

Initial approach

SCPP initially delivered farmer training and traceability service directly as a temporary solution since no market actors were interested or capable of providing these services. Firms were reluctant to invest in farmer training. They relied on public extension workers who, unfortunately, had limited understanding of cocoa cultivation and weak incentives to serve the sector because cocoa, unlike rice, was not a focus commodity. Traceability was a new concept. Developing, testing, and delivering a new commercial service requires a substantial investment of money and time. The future clients of traceability services – cocoa buyers – were not convinced that traceability would work in Indonesia's cocoa sector. No commercial actors were prepared to undertake such risky investments. SCPP filled the gap initially, funded by SECO and five cocoa buyers. Later more donors and firms followed suit. As the commercial benefits of farmer training and traceability services became more evident, SCPP expected specialised service providers – on the supply side – to emerge and replicate and develop further these services, creating a service market, and – on the demand side – cocoa buyers to continue and expand their use of such services.

To ensure the long-term availability of planting material, SCPP supported the establishment of nurseries at the village level. SCPP identified – through farmer training – farmer groups, cooperatives, or individual farmers interested in building a nursery or clonal plot and then supported them with technical and business training and co-funding of construction. Nurseries were expected to become commercially viable through sales of planting materials.

To improve cocoa farmers' access to financial services, SCPP strengthened the demand and supply side and brokered the relationships between both sides. SCPP trained farmers in financial literacy and basic practices in financial management to increase their prospects of accessing formal loans. SCPP worked with existing financial institutions (e.g. banks with coverage in rural areas) and helped cooperatives develop financial products specifically designed for their members.

Changed sector context

Towards the end of 2016, global cocoa prices slumped to their lowest level in a decade. Farmgate prices in Indonesia made cocoa unattractive for smallholder farmers. Many smallholders stopped investing in cocoa and switched to more lucrative crops or sought employment outside agriculture. GAP adoption rates and cocoa yields stagnated, and dropout rates from certification increased.

For cocoa buyers, the price drop called for more efficient supply chain management. The original strategy of expanding their supply chains was no longer appropriate. They needed to consolidate their supply chains and direct their investments towards those traders and farmers with the best prospects of reliably supplying the volumes of cocoa they required. This called for a more sophisticated way of working. Cocoa buyers needed to engage with farmers more closely to better understand and support selected farmers to develop more profitable, resilient cocoa businesses – and remain in the sector.

Adjusted approach

As the sector context evolved, **SCPP adapted its approach from supporting farmers directly to supporting cocoa buyers and other market actors to innovate in order to consolidate their cocoa**

supply chains[2] and continue to support selected farmers sustainably, without further donor funding (see Table 1).

Table 1 Changes in SCPP approach

	Stage 1 (2012-2018)	Stage 2 (2018-2020)
SCPP approach	• SCPP supported cocoa buyers to expand their cocoa supply chains by engaging as many farmers as possible	• SCPP supported cocoa buyers to innovate in order to consolidate their supply chains in a more focused, efficient, effective, and sustainable way
Service provision	• SCPP delivered farmer training and traceability services • SCPP provided direct support to nurseries	• Cocoa buyers, CHs, and Koltiva, a commercial service provider for traceability, delivered farmer training and traceability services • CSP coordinated supporting activities for nurseries under its members' (cocoa buyers) sustainability programmes
Service funding	• Donors and cocoa buyers	• Cocoa buyers

[2] For further detail on the innovations for supply chain consolidation, see Springfield Centre (2021b).

MARKET FUNCTIONS THAT SCPP SUPPORTED

Farmer training

Intervention model

SCPP built its farmer training model on the experience of its predecessor projects[3], most notably PEKA. PEKA focused on improving cocoa farms by introducing better production and post-harvest practices and access to financial services. Scaling up proven models with measurable results was less risky and more efficient than creating and testing new models from scratch. Initially, SCPP's farmer training focused exclusively on farming practices directly related to increasing yield and quality:

- **Farm rehabilitation** included basic practices that did not require much investment, such as pruning trees for optimal structure, removing non-productive and infected buds, frequent harvesting, planting shade trees, and improving the sanitation and drainage of cocoa plantations.
- **Fertilisers:** As a foundation for better fertiliser use, SCPP introduced basic principles and practices of nutrition management for soil (e.g. measuring pH and determining when to use dolomite to raise pH level) and cocoa trees (e.g. different nutrition requirements over a tree's growth stages). Farmers were made aware of the correct application and limitations of chemical fertilisers (e.g. chemical fertilisers can harm plants if the underlying soil conditions are not improved) and learned about organic fertilisers and their function in improving soil structure. As many farms were remote, farmers were encouraged to make their own compost by burying cocoa pods and on-farm organic materials in sanitation trenches. This practice promotes nutrient recycling and prevents the spread of pests and diseases from infected cocoa pods. SCPP trained farmers in proper application techniques (e.g. pocket, row or ring placement, see Figure 2) to reduce nutrition washed away, leached and evaporated, thereby ensuring they got the most from their fertiliser investments (e.g. correct dosing and timing of single and multi-nutrient fertilisers to ensure balanced nutrition).
- **Pesticides:** To enable farmers to control pests and diseases, SCPP introduced Integrated Pest Management (IPM) principles and practices. Farmers were made aware that chemical control (herbicides, insecticides, and fungicides) is the last resort after cultural (e.g. removing infected cocoa pods, burning or burying them with organic waste in composting trenches, and removing pest-harbouring plants) and biological control (e.g. understanding and promoting beneficial insects and microorganisms) options have been exhausted. To enhance the efficacy and reduce the risks of chemical solutions, SCPP trained farmers on correct usage (e.g. identifying pest and disease, active ingredients, dosing, application techniques), storage and disposal (see Figure 2).
- **Seedlings:** SCPP emphasised the importance of rejuvenating mature but low-yielding trees by side grafting and replanting old, non-productive, and diseased trees using top-grafted seedlings to increase productivity. As many farmers did not have access to superior clones, fine grafting skills and grafting equipment, they were encouraged to seek seedlings from nearby nurseries (see subchapter on planting material provision).

[3] For the list of SCPP's predecessor programmes, see Springfield Centre (2021a).

Figure 2 Farmer Field School, row placement of fertiliser and dedicated pesticide storage

SCPP harmonised its training curriculum with the certification requirements of UTZ and RA so that SCPP could guarantee that its GAP training, Code of Conduct (CoC), or certification training would result in certification. Simplifications were made to ensure that farmers, traders, and CHs could comply with the certification control points.

As SCPP progressed, the scope of SCPP's farmer training was expanded to include modules on Good Environmental Practices (GEP), Good Financial Practices (GFP), Good Nutrition Practices (GNP), and Good Social Practices (GSP). Key topics addressed in these modules are listed in Figure 3.

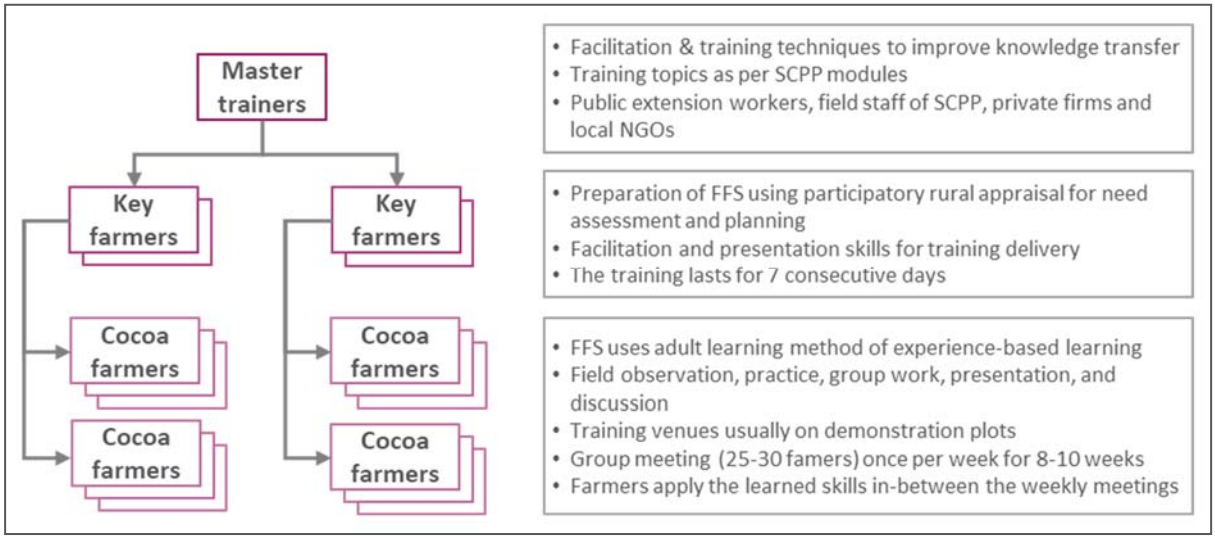
Figure 3 Modules of farmer training delivered by SCPP[4]

SCPP used a tiered, cascading training model to achieve scale (see Figure 4). SCPP trained or involved government extension workers and the field staff of cocoa buyers to maximise outreach and ensure the capacity to deliver GAP training would remain after the programme ended.

[4] Training modules are available in https://www.swisscontact.org/en/mena-1/library, accessed March 2021.

- A cadre of **master trainers** comprising of SCPP field staff, government extension workers, company field staff and local NGOs was developed. SCPP formulated a special module on Good Training Practices (GTP) to support master trainers and key farmers.
- Master trainers selected **key farmers** based on certain criteria and trained them to deliver farmer training using the FFS (Farmer Field School) method. SCPP supported key farmers to establish demonstration plots that could be used for the FFS. A special training module was formulated to guide key farmers in preparing and delivering the FFS. Preparatory activities included conducting location surveys, assessing farmer needs, coordinating with local authorities, and publicising the FFS in local communities.
- Key farmers conducted the FFS, sometimes assisted by the master trainers, for **cocoa farmers** in their group or village.

Figure 4 SCPP's three-tier, cascading training model



In 2018, SCPP adjusted its approach to assist cocoa buyers, CHs and Koltiva, a commercial service provider for traceability, develop and improve their CoC/certification training delivery. Using certification control points as the training framework, SCPP supported the adaptation of elements of its GAP, GEP, and GBP training modules into the CoC/certification training of the private sector. Content was rationalised to only include topics most relevant to firms' specific supply chains to reduce the duration of training from six to two sessions of four hours. This rationalisation was necessary to ensure that the certification premiums could cover training costs. To strengthen their trainers' capacity, SCPP conducted training of trainers (ToT) and provided quality assurance feedback in co-moderated training sessions.

As part of the supply chain consolidation process, SCPP aided partner firms to transition from farmer training to coaching. In 2019, cocoa buyers started to move away from blanket-coverage training to bespoke coaching of selected farmers in their supply chains. SCPP helped them refine their coaching by introducing and piloting innovative approaches to enhance effectiveness (see SCPP case study on innovations).

Outcomes

SCPP trained over 165,000 farmers or 15% of cocoa farmers in Indonesia (see Figure 5). This achievement was notable given the vast geographical area covered – 57 cocoa-producing districts across ten provinces on four islands. In total, 1.9 million person-training-days were delivered. SCPP farmer training was designed as a scalable service with a structured training model, standardised

modules, and clear operational guidelines. It allowed SCPP to quickly expand and replicate service provision to other locations or add additional topics in response to new donors and partners. Thousands of master trainers and key farmers were also equipped with training skills and knowledge of GAP, GEP, GFP, GNP, and GSP.

In the final two years of SCPP, cocoa firms and Koltiva trained and certified over 10,000 farmers, giving an indication of the sustainability of training services. Firms continued training or coaching despite the tightening sector conditions. Buyers remained optimistic because cocoa demand is increasing over the long term, and therefore securing quality, traceable supply from Indonesia will continue to be a priority. They anticipated cocoa prices would pick up in the not-too-distant future because the boom harvests in West Africa could not continue due to decreasing soil fertility and further restrictions on cocoa expansion into forest areas.

Figure 5 End of programme results on farmer training

GAP training increased yields and certification. Farmers' average cocoa yield increased by 53%, from 422kg/ha in 2013 to 647kg/ha in 2020. Around 60% of the trained farmers (92,000 farmers) passed certification requirements and were paid certification premiums. About 55% of the trained farmers adopted at least 75% of the recommended agricultural practices.

The use of organic fertilisers increased. A 2018 study[5] found that the proportion of cocoa farmers using organic fertilisers doubled from 11% in 2015 to 21% in 2017. The dosage of animal manure applied increased from 1.9kg to 3.5kg/tree, demonstrating progress towards the recommended amount of organic fertiliser of 4.0kg/tree.

Despite these positive outcomes, the proportion of farmers adopting organic fertilisers was still far from expectation because of the high transport and labour costs. Should a typical farmer follow the recommended amount of 4kg/tree, he or she must transport 2.8-3.2 tonnes of organic fertiliser either by renting a truck or manually bringing 112-128 sacks @25kg to the farm. Digging composting trenches and carrying and chopping organic materials require a lot of labour. Farmers compared the amount

[5] Swisscontact (2018).

they would have to pay labourers, or the additional workdays required, with, for instance, the amount of money they could earn as a construction worker – the opportunity cost of adoption.

The use of chemical fertilisers increased. An analysis of SCPP cross-sectional data in 2010-2017[6] showed that the use of urea (baseline 93kg/ha) and NPK fertiliser (baseline 84kg/ha) grew by 61% and 333%, respectively, resulting in a yield increase of 446kg/ha or 88%[7]. The adoption of chemical fertilisers was more manageable for farmers than organic fertilisers, as their application requires less additional transportation and labour costs.

Unfortunately, the use of chemical fertilisers subsequently declined when cocoa prices collapsed. To minimise losses, farmers cut back on fertiliser expenditure, their largest cash expense (around 60%[8]) in cocoa farming. This price collapse exposed the underlying weak business feasibility of cocoa farming and its sensitivity to price movements. SCPP supported cocoa sector stakeholders to explore potential solutions to address this emerging challenge (see Box 1).

Box 1 Sector coordination to advocate for and assess the feasibility of cocoa-specific fertiliser

Responding to the declining cocoa prices and yields, cocoa sector stakeholders were looking for a solution that could help farmers maintain their cocoa yields at a reasonable cost. In 2018, CSP collaborated with a cocoa buyer and a fertiliser producer to field test a fertiliser formulated specifically for cocoa (NPK, CaO for soil acidity, micronutrients and trace elements). The testing showed that the application of cocoa-specific fertiliser, combined with good GAP, could increase yields by 60-80%.

In 2019, CSP – with support from PISAgro (Partnership for Indonesia Sustainable Agriculture) – presented the test results to the Ministry of Agriculture and advocated for government support to promote the innovation in key cocoa-producing regions. In 2020, the government allocated partial subsidies for 25,000 tonnes of cocoa-specific fertiliser. To ensure its proper application, SCPP helped CSP establish 242 demonstration farms in partnership with cocoa firms.

The positive results from the advocacy effort will need to be complemented with a transition strategy towards a viable commercial fertiliser market. Government subsidy was a timely support for the ailing sector but this subsidised model cannot be sustained over a long period of time. To guide the transition, SCPP conducted a simple breakeven analysis:

- If each tree was to get 0.75kg commercial fertiliser (fertiliser price IDR 10,000/kg or USD 0.70/kg[9]), then it would need to produce an additional 0.3kg cocoa beans (additional income IDR 7,500 at a cocoa price of IDR 25,000/kg) just to reach breakeven.
- If a benefit-cost ratio (BCR) of around 1.3-1.4 was needed to make the adoption attractive to farmers, then the additional production of cocoa beans would need to be at least 0.4kg/tree.
- Given a baseline of average tree productivity of 0.5-0.6 kg/tree, the expected yield to make cocoa-specific fertiliser attractive would be 0.9-1.0 kg/tree. This is daunting, considering that most farmers supported by SCPP could achieve a yield level 0.7 kg/tree; only a small proportion achieved 1.0 kg/tree or above.
- If the cocoa price was to reach IDR 35,000, then this proposition would become attractive for cocoa farmers (additional production of 0.3 kg/tree – which is still within reach for most cocoa farmers – would produce a BCR of 1.4).

[6] CSP (2018). The sample size was over 40,000 farmers.
[7] The yield improvement was also influenced by other GAP elements such as replanting, rehabilitation, and pest and disease control.
[8] Swisscontact (2017).

Pesticide practices improved. Studies in 2017[10] and 2018[11] found that farmers who received GAP training used significantly less pesticide, by around 1.2l/ha or 23% per year. Annual herbicide and insecticide use also reduced by 17% and 26%, respectively, whilst fungicide use increased. Through more appropriate use of pesticides, trained farmers achieved 11% higher productivity than the control group. Farmers who used both fungicide and insecticide achieved higher yields than those who used either or none, indicating improved control of pests and diseases. The use of herbicide appeared not to affect yields, though it might reduce labour costs. Farmers' handling of pesticides was also found to have changed (see Table 2 and Table 3).

Table 2 Differences in pesticide use between treatment (trained farmers) and control group (non-trained farmers)

Outcome variable	Treatment	Control	Difference
Annual pesticide use [ml/ha or gr/ha]	3,992	5,164	-1,172*
Annual herbicide use [ml/ha or gr/ha]	2,424	2,906	-482*
Annual insecticide use [ml/ha or gr/ha]	1,532	2,061	-530*
Annual fungicide use [ml/ha or gr/ha]	1,377	1,639	-263
Farmers using pesticide	98%	98%	0
Farmers using herbicide	82%	92%	-10%*
Farmers using insecticide	88%	96%	-8%*
Farmers using fungicide	43%	35%	+8%*

*Statistically significant at a confidence level of 95%

Table 3 Changes in pesticide handling before and after attending SCPP's GAP training

	Use of paraquat, a banned herbicide	Pesticide storage		Container handling after use		Use of protective equipment
		at home	in a dedicated place	disposed carelessly	rinsed, chopped, and buried	
Post-line	10%	6%	60%	14%	62%	82%
Baseline	38%	31%	19%	72%	9%	49%

[9] For this calculation an exchange rate of USD 1 = IDR 14,105 was used. (Source: https://www.statista.com/, 2020 annual exchange rate)
[10] Swisscontact (2017).
[11] Swisscontact (2018).

Traceability services

Box 2 Traceability in agribusiness

A widely accepted definition of traceability comes from the International Organization for Standardization (ISO): *The ability to identify and trace the history, distribution, location and application of products, parts and materials, to ensure the reliability of sustainability claims, in the areas of human rights, labour (including health and safety), the environment and anti-corruption.*

Traceability dates back to as early as the 1930s when some European countries wanted to prove the origin of high-quality food such as French champagne. Over the past two decades, food safety related issues have highlighted the importance of traceability. Today, traceability is a useful tool for companies to prove sustainability claims associated with commodities and products.

With increasing demand for organic, fair trade and environmentally friendly products, traceability systems have been continuously upgraded with state-of-the-art technologies and new features to meet stakeholder needs. Companies and other stakeholders within complex supply chains, such as the agricultural and retail industry, have come together to build global multi-stakeholder initiatives in order to trace commodities collaboratively. These global traceability schemes, such as the Forest Stewardship Council (FSC), the Marine Stewardship Council (MSC) or UTZ Certified, have engaged with stakeholders along the entire value chain to develop credible and robust chain of custody standards and certification for products from the raw material to processing, to transportation, and to the final use.

Source: United Nations Global Compact (2014)

Intervention Model

To establish a traceability system, SCPP initially delivered the full suite of traceability functions (excluding certification audits) and subsequently transferred them to supply chain actors. SCPP supported supply chain actors to upgrade their capacity and ensured that they could meet the certification requirements. This tactic was necessary to demonstrate to cocoa sector stakeholders, particularly sceptical cocoa buyers, that creating traceable and certified cocoa supply chains in Indonesia was not a utopian vision. “There is no sustainability without traceability” was the motto promoted by SCPP. The complete traceability system comprised five different functions:

- **Traceability platform (CocoaTrace)**: a mechanism used by all actors along the supply chain to record and manage farmer and supplier profiles and cocoa bean transactions.
- **Internal Management System (IMS):** for administering data and documentation for certification compliance.
- **Internal Control System (ICS):** a farm inspection or internal audit function to check farmer compliance, identify non-compliance and perform measures to rectify non-compliance.
- **Certification audit** by independent auditors authorised by certification bodies.
- **GAP, CoC (Code of Conduct) or certification training** for farmers.

The basic concept of traceability was initially developed under PEKA and then built into a comprehensive Management Information System (MIS) under SCPP. Before and after training, PEKA recorded the production data of more than 12,000 farmers – each with a unique ID – to measure its training impact. SCPP expanded this structured dataset to 60,000 farmer beneficiaries. Unable to find off-the-shelf solutions, SCPP tried to build the system in-house but soon realised a specialised service provider was needed.

In 2013 SCPP engaged a Koltiva, a start-up, to develop a cloud-based data management system accessible through web and mobile applications, called CocoaTrace. In the beginning, CocoaTrace was mainly used within SCPP to record programme-related data about farmers, their farms, production,

and training participation. Data collected by SCPP field staff was verified rigorously before being entered into the MIS. By engaging an external service provider to build the platform, SCPP paved the pathway for commercialising the traceability service and ensuring its sustainability.

In 2014, SCPP rolled out CocoaTrace as the sector's farm management and traceability platform. Donors, partner firms, and other stakeholders received access to use farmer data according to their needs. CocoaTrace enabled transparent and traceable cocoa sourcing. Farmers used an identity card with a barcode when selling their traceable/certified cocoa beans. CHs – through their buying stations – scanned the card, checked the farmer and farm data, including exact location, recorded the transaction directly in the system and printed invoices (see Figure 6). The calculation of bonuses, premiums and prices based on quality happened automatically in the platform. Each transaction had a unique ID and was available online so that the whole process could be traced at any time.

Figure 6 Farmer profile, CocoaTrace ID card and transaction recording for traceability

Initially, SCPP focused on developing cooperatives as CHs and later on shifted to cocoa traders. They received training on Good Business Practices (GBP) or cooperative management, Internal Management System (IMS), and Internal Control System (ICS) to ensure they could record and administer data related to traceability and certification compliance. They were also expected to provide a one-stop service to smallholder producers by delivering additional services: providing seedlings, fertilisers, and financing – the Certified-Farmer Support Package (CFSP).

CocoaTrace included the following features for supply chain management:

- **Cocoa supply data:** Production data from the first year served as baseline; data from subsequent years allowed ongoing assessment. This longitudinal data was invaluable for measuring and understanding changes in farmers' behaviour and performance. The data allowed supply chain partners to monitor and estimate in real-time volumes of certified beans supplied in their areas. This is a critical function for supply chain management and business planning.
- **Farmer profile, training participation and GAP adoption:** Demographic and training data was recorded. The adoption of key elements of GAP, such as replanting, pruning, sanitation practices and fertiliser use was tracked. This enabled early identification of struggling farmers and the need for remedial actions.
- **Farm data and polygon mapping:** A farmer might cultivate cocoa in different locations. Data from each location was recorded separately. Initially, GPS tagging was used, but subsequently polygon coordinates were taken. This allowed the re-calculation of the actual plot sizes and helped clarify inconsistencies in yield data due to the under- and overestimation of plot sizes. GPS data was essential for determining whether a plot was located inside a conservation or protected area: if it was it would be excluded from the certification scheme.

- **Measuring progress and contribution to multi-dimensional sustainability:** To report greenhouse gases (GHG) emission reduction, SCPP developed an estimation model that measured carbon footprint from the use of chemical fertilisers and carbon sequestration. Other dimensions included poverty (Progress out of Poverty Index – PPI), nutrition practices and status (Women Dietary Diversity Score – WDDS), and access to finance.
- **Functions for actors in the supply chain:** Dedicated profiles and administrative functions were created for farmer groups, cooperatives, traders, warehouses, nurseries and input retailers.

As the sector context changed and cocoa buyers shifted to supply chain consolidation, SCPP supported them with innovations that made better use of traceability data to identify progressive farmer networks and influential farmers who can help disseminate recommended practices (FarmNetX) and then support them with more effective tools (Transformative Coaching)[12].

Outcomes

Figure 7 End of programme results on traceability service

SCPP successfully initiated and delivered the traceability service and then transitioned its delivery to market actors (see Figure 7)**.** Approximately 60% of the farmers trained by SCPP supplied certified and traceable global cocoa value chains, accounting for 40%-50%[13] of Indonesia's total cocoa production. Different traceability functions have been taken up cocoa buyers, CHs or Koltiva (see Table 4). Most cocoa buyers have continued to use CocoaTrace; two others developed their own traceability platforms and codes of conduct, not following UTZ/RA standards. Some cocoa buyers and CHs established and expanded their field teams to perform different traceability functions (see Table 4). Others outsourced traceability functions to Koltiva.

Table 4 Traceability functions: who does what

	Who delivers	
Traceability function	**Stage 1**	**Stage 2**
Traceability platform	SCPP and Koltiva	Cocoa buyers, Koltiva
GAP, CoC or certification training	SCPP	Cocoa buyers, CHs, Koltiva
IMS (Internal Management System)	SCPP and Koltiva	Cocoa buyers, CHs, Koltiva
ICS (Internal Control System)	SCPP	Cocoa buyers, CHs, Koltiva
Certification audit	IMO, Control Union	IMO, Control Union

Koltiva, the key provider of traceability services, grew and expanded its service offering. Koltiva started offering full-fledged commercial traceability services in 2017. CocoaTrace, initially offered as

[12] Springfield Centre (2021b).
[13] Indonesia's cocoa production in 2017-2020 was around 200-250,000 tonnes according to ICCO (International Cocoa Organisation).

a software as service (SaaS), was fortified by field-level capacity. Koltiva hired former SCPP field staff to develop a farm inspection or internal audit function, which previously had been delivered by SCPP. Koltiva's team expanded from 15 to 250 people. Two years later, Koltiva expanded its offer to include Chain of Custody (ChoC) training for supply chain actors and CoC/certification training for farmers, which contained simplified aspects of SCPP's GAP and GEP modules. Koltiva continued adding new features beyond traceability services in their service portfolio, such as Customer Relationship Management (CRM), Enterprise Resources Management (ERP), and Sustainability Project Management. Starting from the cocoa sector in Indonesia, Koltiva has expanded its services to various clients in cocoa, palm oil, coffee, coconut, and rubber sectors in more than 15 countries.

Most cooperatives could not perform the functions of CHs because they lacked the management and administration capability to deal with complex certification requirements and processes – most cooperatives' activities were operated by farmers on a part-time basis, not dedicated staff or professionals. Few cooperatives that managed to establish the functions did not last long because they suffered from internal conflicts and corruption.

Local cocoa bean traders had limited success as CHs. Only one large trader managed to deliver certification training and develop IMS for document administration and compliance. For most local traders, these functions were too demanding, let alone providing the CFSP. The certification premiums were inadequate of offering attractive incentives and covering the additional expenses as CHs. Moreover, traders had a weaker long-term commitment to focus solely on the cocoa business. They dealt with multiple commodities and devoted their resources, time and attention to the most lucrative ones.

In contrast, larger-scale firms were able to perform as CHs consistently. Multinational cocoa traders, processors and manufacturers had the capacity and immediate incentives to ensure their cocoa supplies come from traceable and sustainable sources. They also had the long-term incentives to invest in innovations that would improve the performance and efficiency of their cocoa supply chains.

Planting materials

Intervention model

SCPP built its intervention on planting material provision around research-backed innovations in Indonesian cocoa by ACIAR (Australian Centre for International Agricultural Research), ICCRI (Indonesian Coffee and Cocoa Research Institute), and Mars on the screening, breeding, and selection of high-yielding and resistant (e.g. against VSD and CPB) cocoa clones[14]. The research highlighted the importance of local capacity in selecting and propagating superior genotype materials that can be top grafted into seedlings and side grafted into mature cocoa (see Box 3). Combined with simple management practices such as pruning, frequent complete harvesting, and waste recycling, these low-cost methods can substantially improve farm yields and bean quality.

Box 3 Budwood, side grafting, top grafting, and demo farms

Budwood or clonal gardens comprise a mosaic of superior cocoa clones recommended for a specific region. A budwood, also called a scion, is a branch taken from a cocoa tree and therefore holds the same genetic traits and attributes as the tree it has been taken from. Budwoods are used for vegetative propagation of cocoa clones with desired traits, where they are grafted onto seedlings or mature trees. When the cambium of the budwoods is fused with the cambium of the trees or seedlings, they will grow together as one plant.

Top grafting means inserting a budwood into a three-month seedling with a robust root system (rootstock or base plant) usually grown from selected cocoa seeds of vigorous cocoa trees well adapted to the local agroclimatic conditions. Top grafting ensures the seedlings have the same genetic merits as the clones because cocoa trees cross-pollinate, which means that cocoa seeds do not hold the same genetic traits as their mother tree. Top grafted seedlings need a longer time (three to four years) to become productive but promise longer-lasting results up to 20 years.

Side grafting is performed by inserting a budwood into the side of a well-established yet low-yielding mother tree. Side grafted trees can produce cocoa quickly within one to two years. However, if the age of the mother tree is above 15 years, then its productivity can decline within four to five years.

Demonstration farms for rejuvenation and replanting were established in some nurseries because grafting was a completely new practice and had some counterintuitive elements. For example, when side grafts are well established, the canopy and branches of the mother tree need to be removed so that nutrients are directed towards the developing grafts. Farmers who had not observed the benefits of such 'destructive' practice were reluctant to cut the flowering, albeit low-yielding, branches of the mother tree. As a result, the grafts were stunted and could not become productive.

SCPP supported both the demand and supply side of local seedling markets. The GAP training increased farmers' awareness of the benefits of replanting and rehabilitating cocoa farms, stimulating the demand for superior planting materials. On the supply side, SCPP provided technical and business training[15] to farmer groups, cooperatives, and individual farmers interested in establishing nurseries and clonal plots. SCPP also provided superior clones and construction materials that were not initially available at the local level, e.g. UV plastics (plastic with a chemical stabiliser added to it to protect from long-term degradation caused by ultraviolet light), shade nets, and polybags. Nursery operators had to pay for the construction materials, such as poles and wood, and the growing media for the polybags. There was no need to hire labour to construct the nurseries since farmers could build the

[14] ACIAR (2014) and ACIAR (2004).

[15] Swisscontact (2017) Good Business Practices. The manual provides a guidance on starting up a nursery enterprise, which involves several financial and administrative steps that the farmers are unfamiliar with.

nurseries themselves. Farmer groups collected membership fees to pay for the construction material and growing media, but usually only in the first season. The nurseries were expected to become self-sustaining as the seedling sale began and thus did not need further support from SCPP. Nurseries were also encouraged to get business permits and certificates from the local government.

As sector conditions changed and SCPP adapted its approach, SCPP shifted its focus from directly supporting nurseries to helping cocoa stakeholders improve their support to nurseries. SCPP handed over the database of qualified nurseries to CSP, who then coordinated support to nurseries from cocoa buyers. SCPP also assisted CSP to engage the Ministry of Agriculture in government-industry dialogues aimed at adjusting government programmes so that they no longer crowded out local nurseries. This entailed changing the requirements for selling seedlings to government programmes so that competent local nurseries could participate. However, it remains to be ascertained whether public procurement requirements can accommodate these requests.

SCPP and CSP also facilitated cocoa buyers to engage the Indonesian Industrial and Beverage Crops Research Institute (IIBCRI) under the Ministry of Agriculture. IIBCRI is responsible for ensuring that the cocoa seedlings for government programmes are of high quality by supporting the establishment, assessment and certification of budwood and rootstock plots across key cocoa production centres in Indonesia. By engaging IIBCRI, cocoa buyers expected to ensure that nurseries in their supply chain areas had good access to certified planting materials.

Outcomes

SCPP established a solid foundation for the commercial supply of high-quality planting materials in the cocoa sector. SCPP helped make top and side grafting a new norm in good cocoa farming practices. Before SCPP, side and top grafting techniques were known only to researchers and breeders.

- In total, 194ha clonal plots with an annual production capacity of 40m budwoods from 135,000 trees of five superior clones were established and maintained. This capacity was enough for side grafting 20m cocoa trees or 25,000ha of cocoa farms (5-6% of the total harvested areas[16]). Each region had its favoured clones depending on local agro-climatic conditions and farmer preference.
- SCPP helped establish 626 village-level nurseries (see Box 4) with a 105,000 sqm production area across nine provinces. Cumulatively, the nurseries had produced 3.2m seedlings, sufficient for replanting 46,000ha (around 10% of the total harvested areas) of cocoa farms with a 10% replanting rate.

These estimates are conservative, considering that some cocoa farmers could have performed top and side grafting themselves using the superior clones they received from SCPP or fellow farmers.

As the seedling market grew, some nurseries adapted their services to attract customers and meet new demands. Some nurseries offered grafting services. A skilled grafter can earn IDR 90,000 (or USD 6.40[17]) for top grafting 150 cocoa seedlings or side grafting 300 cocoa trees – a half a day task. In comparison, an unskilled cocoa farmer could manage up to 40 top graftings or 80 side graftings a day. Other nurseries offered monitoring visits and agronomic advice to their customers to ensure the purchased seedlings could grow well as expected. Some offered a model whereby farmers only paid for seedlings that survived after several weeks.

[16] ICCO estimated Indonesia produced 250-300,000 tonnes cocoa in 2018-19. With an average annual productivity of 600-700kg/ha, the estimated harvested area was 400-500,000ha.

[17] For this calculation an exchange rate of USD 1 = IDR 14,105 was used. *(Source: https://www.statista.com/, 2020 annual exchange rate)*

Box 4 Story of a nursery entrepreneur – Muhamad Nasir, West Sulawesi

"Before I joined the training, I had replaced some less productive cocoa trees with local seedlings, but most of them died," says Nasir. "Farmers in my village have almost lost their faith in cocoa farming, so during the training I was particularly interested in the top- and side-grafting techniques that I can use to rejuvenate my cocoa farm. It´s important that there are seedlings available for replanting – therefore the field facilitator encouraged my group to establish a nursery. It was difficult to convince the other group members to run a nursery together, so I eventually decided to build my own nursery."

Nasir borrowed money from a relative to invest in equipment for the nursery. SCPP provided a UV plastic roof and shade cloth for his 117m2 nursery. He bought wood, polybags and fertilisers himself. As soon as Nasir had the first bundle of top-grafted seedlings ready for transplanting, his neighbours started buying seedlings for their cocoa farms. *"So far, I have sold 3,000 top-grafted seedlings, paid back my loan, and made a profit of about IDR15m (approx. USD 1,205[18]). The demand for cocoa seedlings is still surprisingly high, even within the boundaries of my village,"* Nasir states.

Source: Swisscontact (2014).

Despite these achievements, only 40% of the nurseries established continued to operate. Collectively-owned and managed nurseries proved fraught with internal issues, e.g. conflicts among leaders or between leaders and members, and corruption cases. They suffered from dysfunctional incentive structures. Typically, only a few farmers were active in the group, but they needed to share the fruits of their labour (i.e. seedlings and sales revenue) equally with all 25-35 group members, making the business unlucrative.

The survival rate of individually-owned and managed commercial nurseries was higher because they had more straightforward decision-making processes and incentive structures. They were profit-oriented and responsive to market opportunities and changes. Owners could calculate their operational costs and expect predictable returns. They did not hesitate to invest in repairing or upgrading production facilities or cover losses due to external factors, e.g. extended droughts or forest fires, so long as the business prospects remained positive.

Smaller nurseries dependent on local demand were susceptible to market shocks. They built their operations on the comparative advantage of market proximity – short distances and people-to-people interaction – serving their own groups and farmers within the same village, a limited market. As soon as local demand was met or declined, these small nurseries could not sustain their operations. Serving customers outside their village proved not to be commercially feasible because it involves higher marketing, coordination, transaction, and transportation costs.

Later work with cocoa firms on nursery development revealed that larger nurseries were more resilient. They had at least 250 sqm of production area, four times larger than the initial nursery model, employed external labour, and had more resources to trade more widely. Larger nurseries aimed to serve larger markets: other villages, sub-districts, districts, and large firms and government projects. If local demand declined, they could compensate with sales to other locations or large buyers.

SCPP's decision to promote research-backed innovations was pragmatic and successfully 'commercialised' the innovations. By promoting rejuvenation and replanting amongst farmers (demand side) and supporting clonal plots and nurseries (supply side), SCPP institutionalised the

[18] For this calculation an exchange rate of USD 1 = IDR 14,105 was used. *(Source: https://www.statista.com/, 2020 annual exchange rate)*

innovations in a commercial delivery model. So long as cocoa prices remain within a reasonable price range, this supporting function should persist in Indonesia's cocoa sector.

Financial services

Intervention model

SCPP's access to finance interventions had three elements: strengthening the demand side, strengthening the supply side, and brokering relations between market actors on both sides:

- To improve the prospects of farmers to access financial services, SCPP delivered Good Financial Practices (GFP) training to cocoa farmers or their household members responsible for managing household finances, farmer groups, nurseries, and small traders. GFP covered financial literacy (financial goals, principles in managing incomes, expenses for consumption and investment purposes, assets, liabilities, risks, and contingency funds) and financial practices (simple bookkeeping to record cash flows, balance sheets, and financial planning). GFP also introduced basic knowledge of different financial products, their requirements, benefits and risks.
- To enable bank staff, especially loan officers, to assess the potential and risks of lending to the cocoa sector, SCPP developed and delivered two training modules. The first provided information about Indonesia's cocoa sector: conditions and growth patterns, the value chains and market actors involved, opportunities and constraints, categories and prices of cocoa beans, quality, certification, and traceability. The second dealt with financial issues in the sector: financial needs of different farmer categories, cultivation and harvest cycle and cash flow over the year, risks and how to mitigate them, different financial products, value chain finance and other financing schemes. SCPP also helped cooperatives establish a financial division and develop financial products for their members.
- To build better relations between banks and farmers, SCPP invited bank officers to participate in GFP training. Account officers delivered parts of the GFP training, e.g. financial products, and assisted farmers in opening saving accounts at the training locations. Using CocoaTrace data, SCPP identified farmers that were potentially eligible for bank loans (yield level above 500kg/ha and cultivation area above 1ha to ensure sufficient cash flow and repayment capacity) and offered them loan recommendations. Through networking events, SCPP introduced banks to potential clients (farmer groups, cooperatives, and traders) and their financial needs.

To reduce the risk of loan default and indebtedness, SCPP began emphasising savings for cocoa farmers with low creditworthiness. A 2015 study[19] revealed that more than half of the cocoa farmers had an annual yield below 500kg/ha, i.e. weak business feasibility. They were encouraged to improve productivity using basic farming practices that did not require substantial working capital, e.g. improving field sanitation, pruning, side grafting of low-yielding mature trees, or gradually replacing non-productive trees. These small investments could be financed without borrowing.

SCPP undertook other measures to improve farmers' access to finance. It supported farmer groups to acquire formal land titles from the National Land Agency that could be used as loan collateral. SCPP also explored mobile banking and mobile wallets to overcome the limited geographical coverage of bank branches. Unfortunately, limited phone coverage in rural areas impeded this solution. The fees charged by the providers were also too high for low-value transactions by cocoa farmers.

[19] Swisscontact (2015).

Outcomes

Box 5 End of programme results on financial services

Estimated 53,000 cocoa farmers, farmer organisations, and traders used loan and/or saving products with a total value of USD 30m

92,000 cocoa farmers trained on GFP by 455 master trainers

SCPP's efforts to improve cocoa farmers' access to finance was underpinned by the GAP training and valuable data from CocoaTrace. The GAP training improved farmers' creditworthiness by increasing their yields and incomes. CocoaTrace's data allowed banks to better understand cocoa farmers as customers, their financial histories, and whether they had a land title.

SCPP also helped influence cocoa stakeholders to be less loan focused and more aware of the benefits of saving. The private sector did not initially see savings as contributing to the sector's financial needs. A common refrain was that "farmers are too poor to save" and "they need a loan". That perception changed as stakeholders realised that most farmers were not creditworthy but still needed to build up the financial means to invest in their farms and set aside funds to make them less vulnerable to economic shocks.

Despite these promising outcomes, the take-up of saving and loan products was lower than expected. The global price collapse exposed the underlying fragile business feasibility of cocoa farming and weakened the demand for financial services to rehabilitate cocoa plantations. Many cocoa farmers shifted the use of their limited financial resources to more rewarding income opportunities.

Cooperatives failed to establish and deliver financial services to their members, even though SCPP had provided intensive support, e.g. developing 13 business models and various loan schemes specifically designed for cocoa farmers and cocoa businesses. Few supported cooperatives that piloted saving and loan services could not scale up. They lacked the managerial and organisational capacity to manage large amounts of funding and pushing them to do so would increase the risk of fund misuse and embezzlement.

Cocoa sector stakeholders did not adopt the functions delivered by SCPP. Banks did not adopt the GFP training as a tool to expand their customer base in the cocoa sector and adapt the training modules for loan officers to their internal capacity building programme. The training modules were developed as technical inputs 'for banks' instead of 'with banks' as a new way of working in the cocoa sector. Similarly, other functions on loan recommendations based on CocoaTrace data, networking events, and support for land registration were not taken up by any market actors. This left questions about the sustainability of functions on access to finance in Indonesia's cocoa sector.

LESSONS

SCPP's experience in establishing and strengthening market functions to make Indonesia's cocoa sector more sustainable, competitive and resilient has highlighted several lessons that might be more widely applicable agricultural development initiatives. These lessons relate to the role of development organisations, the importance of doing the right type of analysis, and focusing on function before form.

Role of development organisations: provide or facilitate?

Direct delivery can be a valid tactic, but it must be guided by a vision for sustainability

Programmes may contemplate direct delivery in underdeveloped markets to get things going. But they should consider carefully when this is appropriate and what risks need to be mitigated (see Table 5). This can be aided by having a realistic vision of sustainability from the outset, which can be translated into a transition strategy to guide the programme's actions over time.

Table 5 When to consider direct delivery and how to manage its risks

Conditions and considerations	Risks and mitigation
• **Strong rationale:** a clear logic explaining how the missing functions can unlock growth opportunities and transform the sector, underpinned by robust evidence on their efficacy from pilot activities or elsewhere. • **Weak supply side:** no private and public service providers with the immediate incentives and capacity to develop and deliver the service in target locations or supply chains. • **Ascertained (latent) demand:** private actors with a willingness to pay but not yet fully convinced whether and how the services would satisfy their needs. • **High barrier to entry:** the initial development of the services involves substantial investment, time, and risks that cannot be borne solely by individual market actors.	• Direct delivery may take programmes into a **comfort zone**: the longer a programme remains in delivery mode, the more difficult it is to facilitate others. It is best to keep direct delivery **timebound** and as **a temporary role**. • **Direct delivery may appear as an end in itself, but it needs to be treated as a means to an end**: creating momentum for sector-wide change by proving results, demonstrating commercial feasibility, and stimulating demand. This perspective needs to be maintained throughout the process. Direct delivery cannot just be about 'chasing numbers'. • Although widely assumed, **demonstration effects rarely trigger spontaneous uptake.** A clear **pathway for transitioning services** to willing and capable service providers is needed from the beginning. Programmes need to identify and support potential providers to take up and deliver the services and test that the delivery model fits with their incentives and capacity.

SCPP stepped in to provide farmer training and traceability services because no market actor was willing and capable of doing it. Developing and delivering a farmer training curriculum that guaranteed yield increases and certification was not an easy task. Establishing a traceability system and ensuring error-free functionalities demanded substantial upfront investment and client management. Reaching a large number of cocoa farmers and traders in widely dispersed rural areas was another challenge.

Supported by donors and cocoa-buying firms, SCPP filled this gap to demonstrate that farmer training and traceability made business sense as part of cocoa firms' supply chain management. SCPP then transitioned these traceability functions to market actors who had the incentives and capacity to continue them: cocoa buyers, CHs, and Koltiva. Some cocoa buyers and CHs delivered some of the traceability functions using their internal teams as part of their supply chain consolidation. Others subcontracted it to Koltiva, which had the incentive to offer the full suite of traceability functions.

Ensure feasibility for commercial delivery within prevailing capacity and affordability

Aid funding risks creating gold-plated solutions: ideal and comprehensive solutions that are not feasible in a commercial setting. SCPP could afford comprehensive training modules and CocoaTrace

functionalities because donors covered the development and delivery costs. Cocoa buyers, CHs, and Koltiva had to streamline the content of farmer training and CocoaTrace functionalities, stripping them to the bare minimum to afford the delivery costs. If the vision is a commercial delivery model, then the initial design of the solutions needs to be 'right-sized' to that reality. It can save time and money and simplify the transition process.

Build on what's already there

It's easier to add new functions to existing businesses than to set up new businesses specifically for delivering those functions. Established enterprises have better capacity and incentives to integrate new functions that can strengthen their core business, and to operate with economies of scale to improve viability and resilience. For example, cocoa buyers successfully integrated certification training and some traceability functions into their supply chain operations, while newly established cooperatives and groups struggled.

Do the right kind of analyses

Start with a feasibility analysis and revisit it regularly

Feasibility analysis of farming business models needs to inform the selection of an appropriate sector growth strategy, e.g. expanding supply base by engaging many more producers or consolidating production to a smaller number of higher-performing producers. Such analysis needs to identify critical income and cost components, their sensitivity to external factors, e.g. changes in farmgate or input prices, and help build an understanding of farmers' incentives.

Starting in a context of supply shortages and high cocoa prices, SCPP did not explicitly check the business viability of smallholder cocoa farming. The price slump forced SCPP to do this. It exposed some fundamental problems in the relationship between the cost of inputs and investments, and their returns on yields and profits: only farmers with certain yield levels and characteristics could survive in the long run.

In hindsight, the feasibility analysis could have advised cocoa buyers to be more selective already in stage 1: investing in farmers with the right characteristics, e.g. those who had adopted critical GAP elements and achieved a minimum level of productivity. It could also have pointed to risk mitigation options against the price drop, e.g. temporarily adjusting price premiums to retain prospective farmers.

Perform cost-benefit analyses for the adoption of recommended practices

A widely-held assumption is that farmers do not follow good practices because they do not know how – a knowledge problem. In reality, it is often an incentive problem: adopting new practices entails additional cash, labour, time, complexity or risk. Farmers weigh these 'costs' against the expected benefits, and if the net benefit is not sufficient, they will not follow the recommendations. Cost-benefit analysis provides clarity on these issues and helps reveal potential drivers or blockers of behaviour change. For example, a potential solution to reduce the adoption costs of composting is to promote local mechanisation services for digging composting trenches and chopping organic materials instead of promoting manual labour. Similarly, a cost-benefit analysis can determine the minimum supply volumes, margins, and the optimum number of farmers to attract more traders to invest in the delivery of certification training and other traceability functions.

Form follows function

Organised collective actions are not a panacea for farmer problems

There is a development and philanthropic belief that collective forms, such as farmer groups and cooperatives, can deliver better services and benefits to farmers than those provided by 'exploitative' individual traders and intermediaries. This belief is premised on altruism: that farmers behave in the best interest of other fellow farmers. Farmers help, not exploit, each other.

SCPP's experience showed that this assumption is not (always) valid. Group- and cooperative-delivered functions (e.g. nurseries or CH functions) mostly failed due to internal conflicts and dysfunctional incentive structures, i.e. behaviour that was not altruistic but driven by individual interests. If a private nursery delivers a bad service to its customers, it loses customers and business. With group-based businesses, the profit motivation is often less clear (especially if they are propped up by project funding), as is the accountability. Members of the group can find it hard to vote with their feet when they are not getting what they need. A collective form is no guarantee of effective or fair delivery of a function. Some functions often do need to be delivered on a collective basis (e.g. representation, advocacy or setting industry codes of conduct) but that determination should be led by analysis not driven by prescription.

Focus on market actors with the strongest incentive and capacity to perform the function

A key lesson seems to be to identify market actors, whoever they are, that have the strongest incentives and capacity to perform the function. In planting material provision, individually-managed nurseries could survive better because they had a more transparent incentive structure and straightforward decision-making process than group-based ones. The few group-based nurseries that did survive were operated by a small, tight group of farmers with aligned interests and a clear division of tasks and responsibilities for running the business.

In the case of traceability services, cooperatives and local traders had limited capacity in terms of people, finance and logistics. They were not able to deal with the complex tasks of running certification training, IMS, and ICS, let alone providing seedlings, fertilisers, and finance – the Certified-Farmer Support Package (CFSP). Only international cocoa firms had the capacity to deliver the traceability functions in-house or outsourced.

Size does matter for resilience against market shocks

Large enterprises with the capacity and economies of scale to serve diversified markets can weather fluctuations. This builds resilience into the system. Larger nurseries could respond to demand outside their districts. They could acquire business licenses and satisfy the legal commitments to produce a minimum number of seedlings for certification. They could meet government procurement requirements and thus win government contracts – the only sizeable demand for cocoa seedlings amidst slumping cocoa prices. In contrast, micro-scale nurseries could only serve local needs. They did not have other options and had to cease operation when local demand diminished. This left those farmers who did want to buy planting materials vulnerable. Local is not always best.

Be mindful of the differences between programme MRM (monitoring and results measurement) and MIS (management information system) needed by market actors

SCPP's monitoring and results measurement relied on Koltiva's CocoaTrace platform. While there are some overlapping data requirements of the market actors using CocoaTrace and the aid-funded SCPP, there are also different – even competing – needs. With the benefit of hindsight, SCPP would have benefitted from having more capacity to establish and operate its own MRM system, in addition to and complementing Koltiva's traceability system.

As a development initiative, SCPP required data to help it manage different interventions with distinct objectives targeted at the sector's development. It needed to be able to 'step back' from delivery of activities to assess more strategically whether its actions were having an impact on the sector – whether it was doing the right thing, as well as doing things right. It needed to be able to extract data and insights needed by its development funders.

CocoaTrace, as a commercial service, was not set up to accommodate all development indicators required by many donors – many of which were irrelevant for private clients. Traceability requires a defined data set and level of coverage. Adding new indicators to the platform is costly, takes up space and resources, and can slow down the system.

Not all the programme's measurement requires the comprehensive and routine coverage provided by CocoaTrace's traceability service. Many developmental indicators, studies on specific topics, etc. could be captured through smaller sample sizes and periodic assessments without needing to be integrated into and burdening CocoaTrace.

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