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Post-Harvest Inefficiencies and Downstream Value Concentration: A Field-Based Value Chain Analysis of Thailand's Cacao Sector

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Abstract

Thailand's cacao sector is expanding, yet smallholder farmers continue to capture only a minimal share of the final chocolate value. This study maps the Thai cacao value chain from farm to consumer, drawing on primary data from interviews from 6 farmers, 4 processors, and 2 chocolate makers across multiple regions of Thailand. The research incorporates both quantitative value chain analysis (VCA) and qualitative SWOT assessment. Farmers benefit from favourable growing conditions and low costs but face small-scale production, volatile yields, and limited incentives or capacity to ferment. Processors operate in a fragmented, weather-dependent supply chain and rely on intuition-based fermentation, resulting in inconsistent quality. Chocolate makers face chronic shortages of well-fermented beans despite strong demand and high retail prices. VCA findings show farmers and processors capture only 5–7% of the final value, with most accruing downstream. Comparison with Vietnam's more formalised post-harvest system shows that, even with superior fermentation structures, upstream actors retain minimal value, suggesting that chain organisation, rather than quality improvement alone, determines value distribution. Strengthening cooperative fermentation, consolidating post-harvest centres, and expanding direct-trade models present key opportunities to raise bean quality, stabilise supply chains, and support Thailand's growing premium chocolate industry, though comparison with Vietnam suggests that structural improvements alone may be insufficient to substantially increase farmer income.

Keywords

Cacao, Value Chain Analysis, Thailand

1. Introduction

Global demand for chocolate has increased, raising interest in cacao as an emerging crop. According to Grand View Research (2024), the premium chocolate market was valued at USD 31.87 billion in 2024 and is projected to reach USD 40.60 billion by 2030, with a compound annual growth rate (CAGR) of 4.3% from 2025 to 2030. Research conducted by Beg et al. (2017) indicates 80-90 per cent of the world's cocoa crop is produced by smallholder farmers, with farmers in West Africa typically earning just 3.5-6.4 per cent of the final chocolate value. Fountain and Hütz-Adams (2022) report that globally, farmers capture only 6–8% of the final chocolate retail price, down from approximately 16% in the late 1980s. A comprehensive FAO and BASIC (2020) study found that 70% of total value and 90% of total margins in the cocoa-chocolate chain accrue to brands and retailers.

There has been growing interest in Thailand's cacao industry, with notable funding from Chulalongkorn University to establish the Innovation Centre for Research and Development of Sustainable Thai Cacao (Limkhuansuwan 2024). Additionally, Chulalongkorn's School of Agricultural Resources claims cacao is a "future economic crop of Thailand" (Chulalongkorn University 2024). In recent years, Thailand has seen growth in cacao cultivation, with more artisanal Thai chocolate companies and heightened interest in the cacao industry. In Thailand, cacao production in 2023 totalled 3,360 tons (Lorsuwannarat 2025). Approximately 18,023 rai of registered cacao plantations were located in Thailand

(Limkhuansuwan 2024), with many more unregistered plantations also present. The emerging industry has driven export-driven consumption, alongside existing local demand for locally grown cacao beans. Thailand's growing interest in cacao also reflects broader agricultural trends. Prommawin et al. (2024) found that Thai farm households with diversified crop production demonstrate greater adaptive capacity against climate change, supporting national policies that encourage farmers to adopt emerging crops such as cacao. The World Bank (2022) has similarly identified crop diversification toward higher-value products as a key pathway for improving Thai smallholder incomes.

1.1 Research Objectives

This study aims to map the Thai cacao value chain from farm to consumer in order to identify structural inefficiencies and explain patterns of value distribution across actors. By conducting primary field research with farmers, processors, and chocolate makers across multiple regions of Thailand, this research seeks to understand how value is distributed along the supply chain, what post-harvest inefficiencies constrain upstream actors' income potential, and whether quality improvement alone is sufficient to enhance farmer profitability

2. Literature Review

This literature review's focus is on post-harvest processing, particularly fermentation and drying, because these stages determine bean quality, offer the greatest potential for farmer value capture, and remain structurally inefficient in many producing countries, including Thailand. Understanding these post-harvest dynamics is therefore essential for analysing possible upgrading pathways in the Thai cacao supply chain.

2.1 Post-Harvest Challenges Due to Lack of Training and Knowledge

One of the key challenges Vietnam faced in its supply chain was inconsistent fermentation. Similarly, studies in Indonesia suggest that the country's cacao industry is plagued by low-quality farming and inadequate post-harvest handling, primarily due to the desire for quick returns. (Sa'adah et al. 2024). Additionally, a study by Benjamin et al. (2018) suggested that the key issues in the cacao supply chain in Colombia are inconsistent and unskilled fermentation practices, resulting in low premiums and limited incentives for this process. Effendy et al. (2019) surveyed 284 cocoa farmers in Central Sulawesi and found that more than 50% did not ferment their beans, with the decision shaped by education level, production volume, and the negligible price premium for fermented output. Leksono et al. (2021) found that 70% of Indonesian cocoa output is graded as poor quality due to traditional post-harvest management and inadequate farmer training. A global review by Daymond et al. (2022) confirms that fermentation adoption varies widely, with the practice nearly universal in West Africa but rare in Indonesia, where beans are mostly sold unfermented.

While Thailand's annual cacao production of 3,360 tons (Lorsuwannarat 2025) is still relatively small compared to Vietnam, Colombia, and Indonesia, the structural issue of low-quality fermentation is also evident in Thailand. A study by Sripolkrang and Saenchaiyathon (2023) identified inconsistencies and poor management in the post-harvest system. Furthermore, a case study of The Tha Sala Community Enterprise, located in Nakhon Si Thammarat Province, provides insight into community-level cacao processing in Thailand. Specifically, Jansrinak et al. (2023) identified outdated equipment and insufficient knowledge of fermentation as contributing to a lack of product competitiveness. This resulted in a lack of standardisation in production and post-harvest, with no certifications, hygiene controls, or quality controls.

2.2 International Solutions for the Lack of Knowledge

Compared to other countries, Vietnam has a widespread, efficient approach to addressing low-quality, inconsistent fermentation. Vietnam uses a centralised fermentation site model called Fermentor Clubs. In a study by Nguyen (2014), 2,000 cacao household farmers who grew cacao pods sold the cacao fruit to 101 Fermentor Clubs.

In Nan province, Thailand, Na Nan et al. (2024) utilised a three-step system in which farmers sold cacao pods to collectors, who then sold them to processors who fermented and dried the beans. Changes to the supply chain involving grading systems were implemented, and upgrades were made to improve skills and provide knowledge to farmers, collectors, and fermentors. This resulted in a 72.17% increase in farmer income and a 44.65 kg increase in yield from 15.56 to 60.21 kg of cacao pods per rai. Collector income also rose by 102.9% due to the implementation of a quality grading system, and processors can earn an average revenue of 187,800 THB/month. In Ghana, Aniagyei et al. (2024) found that demonstration farms were the most effective extension method for improving cocoa quality, with a 72.92% effectiveness rating among surveyed farmers, suggesting that practical, hands-on learning hubs could also benefit Thai

cacao farmers. Similarly, Donkor et al. (2023) demonstrated that cooperative membership significantly increases both technical efficiency and cocoa yields through better access to training, extension services, and peer learning.

2.3 Post-Harvest Challenges Due to Low Premiums and Incentives

A study in Indonesia suggests there is insufficient incentive for farmers to ferment cacao beans. According to Sa'adah et al. (2024), farmers typically earn only an additional IDR 1,000 per kg of fermented beans compared to unfermented beans. Specifically, the premium for fermented beans is IDR 1000-5000 per kg (approximately THB 2.01-10.04). Similarly, in Colombia, a cacao sector dominated by smallholder farmers, fermentation practices are too low (~COP$200–300/kg) to justify the labour and costs of proper fermentation (Benjamin et al. 2018). Soemarno et al. (2015) confirmed this pattern in Jembrana Regency, Indonesia, finding that the farmgate price premium for fermented beans was only approximately IDR 935/kg, insufficient to offset fermentation costs including weight loss and additional labour hours. Village middlemen readily purchased unfermented beans without quality differentiation, eliminating any market signal for farmers to invest in processing. At a global level, Staritz et al. (2023) showed that a small number of grinder-traders hold disproportionate price-setting power in the cocoa value chain, leaving producer countries as price-takers and farmers capturing roughly 7.5% of the total chain value.

2.4 International Solutions for Low Premiums and Incentives

The study in Haiti and in Nan suggests that much larger premiums can be achieved to incentivise higher-quality production through proper processing techniques, enabled by better knowledge and equipment. In Haiti (Bockel et al. 2019), after improvements were made to the post-harvest system, operator income rose by 156% ($1,351 to $3,464). In Nan province, the average revenue for processors of 187,000 THB also suggests that, when appropriately conducted, fermentation can offer attractive premiums, addressing the low incentive structure for fermentation in Colombia and Haiti.

2.5 Post-Harvest Challenges Due to Weak Supply Chain

Within all the countries studied, there are certain similarities and differences in the supply chain. Vietnam has the most structured supply chain, with a clear division of labour from the farming stage to the processing (fermenting and drying) phase. In Colombia and Indonesia, there is a lack of a formal, structured supply chain. Many countries rely on farmers to grow and process cacao beans, suggesting a lack of division of labour. Neilson et al. (2020) documented similar fragmentation in Indonesia, where 99% of cocoa comes from smallholders on farms under 2 hectares. Despite policies encouraging domestic processing, the grinding sector became dominated by multinational firms, and benefits did not reach farmers. Kopp and Sexton (2021) further demonstrated that buyer market power exercised at both trader and processor stages compounds to significantly depress farmgate prices, a pattern they term "double marginalization."

This suggests that structured supply chains with a clear division of labour, where farming and post-harvest are distinct processes, may be more successful than those without such a separation. However, studies that present a structured supply chain, such as those conducted in Haiti and Nan, show a greater increase in farmer and processor income.

2.6 International Solutions Due to a Weak Supply Chain

In Colombia (Benjamin et al. 2018), the study highlighted limitations in relying on individual farmers to handle post-harvest processes. To address this, the study recommends the development of cacao cooperatives that function as centralised fermentation sites with staff dedicated to fermentation. These fermentation sites will operate similarly to those in Vietnam and Haiti, where farmers sell their cacao pods and the sites process the wet beans by fermenting and drying them, applying standardised post-harvest protocols. This reduces the burden on farmers of processing wet beans themselves and could result in more consistent, controlled output through centralised handling.

In Vietnam (Nguyen and Hussen 2014), a system is described in which farmers sell their cacao pods to Fermentation Clubs. An experienced, knowledgeable farmer purchases the cacao pods, ferments, and dries the beans to produce dried cocoa beans. In Haiti, a system of co-operatives operates similarly to the Fermentation Clubs in Vietnam. The successful case study conducted by Na Nan et al. (2024) in Nan implements a similar method but deviates in that it involves three layers of the supply chain. Whether this three-step or another two-step supply chain is more efficient is open to debate. However, the common denominator across all successful systems is a formalised central fermentation site and clear division of labour. Direct-trade models offer another pathway. Middendorp et al. (2020) found that Ecuadorian cocoa smallholders in direct-trade relationships captured superior prices and had greater access to

agricultural training compared to mainstream-market counterparts. Cadby and Araki (2021) noted that specialty cacao prices are typically double or more than commodity prices, and that 38% of craft chocolate makers use direct trade as their primary sourcing model.

3. Methodology

This section outlines the research design and sampling strategy used to investigate the Thai cacao value chain. By employing a mixed-methods approach, this study integrates quantitative data from diverse respondent groups with qualitative insights to provide a comprehensive overview of the current industry landscape.

3.1 Research Design

The data collection instrument in this study was a questionnaire. The questionnaire covered both quantitative aspects of yields and finances and qualitative aspects of knowledge and understanding. There will be three different versions of the questionnaire for three categories of respondents (farmer, processor, and producer).

3.2 Study areas and Population

The study was conducted in 5 regions (North, East, West, and Central) that are among Thailand's highest-producing cacao regions. A mixed approach is also considered to obtain data and develop understanding at the macro scale, as well as to compare potential differences between regions.

The study focuses on cacao crop-producing farmers and processors who ferment and dry cacao beans, as well as chocolate makers in Thailand. This study will utilise a comprehensive questionnaire to source data. The analytical approach follows established value chain research frameworks. Kaplinsky and Morris (2001) outline a systematic methodology for value chain mapping, including cost-benefit analysis and profit distribution among actors, which informs the quantitative component of this study. Trienekens (2011) further develops a VCA framework for developing countries that incorporates constraint identification, value chain element definition, and upgrading options, providing the theoretical basis for the structural analysis conducted here.

3.3 Sampling Size and Procedure

The sample comprises: 6 cacao farmers; 4 cacao processors; and 2 chocolate producers

The cacao farmers were selected from different regions of Thailand (with varying levels of experience and farm size). Farmer 1 was from Eastern Thailand and had 5-6 years of experience growing cacao; Farmer 2 was from Eastern Thailand and had 3 years of experience growing cacao; Farmer 3 was from Eastern Thailand and had 6 years of experience growing cacao; Farmer 4 was from Western Thailand and had 5-6 years of experience growing cacao. Farmer 5 was from Western Thailand and had 5-6 years of experience in growing cacao; Farmer 6 was from Northern Thailand and had 5-6 years of experience growing cacao.

The cacao processors selected had varying levels of experience and fermentation scales and sizes. Processor 1, based in Eastern Thailand, has 5-6 years of experience and ferments 2,400 kg per month; Processor 2 was from Western Thailand, with 5-6 years of experience, and ferments 2,400 kg per month; Processor 3 was from Central Thailand, with 1 year of experience, and ferments 40,000 kg per month. This processor was the manager of the recently established Chocolate producer's post-harvest centre; Processor 4, from Northern Thailand, has 5-6 years of experience and ferments 1,300 kg of cacao.

The selected chocolate producers have significant experience and large market shares in the premium Thai chocolate market. Producer 1 has 8 years of experience and produces 700-900 kg of chocolate per month; Producer 2 has 9 years of experience and produces 300-400 kg of chocolate per month.

3.4 Survey Instrument and Procedures for Data Collection

Data collection was conducted between 05/10/2025 and 16/11/2025 across five regions of Thailand. Semi-structured interviews were carried out in person at farmers' plantations, processing facilities, and chocolate production sites. Each interview lasted approximately 30-60 minutes and was conducted in Thai. Responses were recorded with participant consent. All participants were informed of the research objectives and provided verbal consent prior to participation. Each respondent in the study completed a thorough questionnaire. The questionnaire varies across respondent categories (i.e., farmers, processors, and producers). The questionnaire is divided into three main parts: Quantitative

data on yield and financials, Qualitative open-ended questions on post-harvest practices, Perceived challenges in the Supply Chain (Table 1).

Table 1. Overview of questionnaire

Category of Respondent	Quantitative	Qualitative	Challenges
Farmer	a. Monthly production volume b. Land size and yield c. Cost of production per kg d. Selling price per kg	a. Fermentation practices and decision-making b. Knowledge and willingness to ferment c. Buyer relationships	a. Barriers in production and post-harvest handling b. Income constraints c. Market access issues
Processor	a. Volume of cacao purchased b. Fermentation yield c. Cost of fermentation per kg d. Export vs domestic sales ratio	a. Use of tools or scientific methods b. Buyer segmentation and price variation c. Price incentives for quality beans	a. Issues with bean quality or fermentation consistency b. Infrastructure or capacity constraints
Chocolate Producer	a. Volume of beans purchased b. Chocolate output (kg/month) c. Selling price per kg d. Cost of chocolate production	a. Bean sourcing preferences (e.g., fermented, direct trade) b. Price premiums for quality c. Supplier relationships	a. Problems sourcing consistent or high-quality beans b. Perceived limitations of Thai cacao competitiveness

4. Data Collection and Analysis

This section outlines the mixed-methods approach used to evaluate the project's feasibility, beginning with a quantitative breakdown of the value chain followed by qualitative analysis.

4.1 Quantitative Analysis: Value Chain Analysis

Value Chain Analysis (VCA) will be used to analyse the cacao supply chain. This method will determine the value each actor (farmer, processor, and producer) captures within the supply chain and will be used to compare Thailand's cacao industry VCA with Vietnam's VCA. These are the steps in calculating and analysing the VCA: (1) Finding Descriptive statistics, including calculating yields, selling price, and revenue approximations; (2) Value Share Calculation to express each actor's income as a percentage of the final chocolate retail price; and (3) Thailand's VCA will be compared with Vietnam to identify structural differences and similarities between the two countries.

4.2 Qualitative Analysis: SWOT Analysis

SWOT Analysis will be utilised to analyse qualitative data. The SWOT framework, including strengths, weaknesses, opportunities, and threats, will be utilised. Within the four areas of the SWOT framework, I will include my own critical reflections and interpretation of the Thai cacao industry.

5. Results and Discussion

This section presents the findings from the value chain analysis and discusses their implications for the Thai cacao supply chain.

5.1 Thai Supply Chain Descriptive Findings

The Thai cacao supply chain consists of three primary actors: smallholder farmers who cultivate and harvest cacao pods, processors who ferment and dry the beans, and chocolate producers who convert dried beans into finished chocolate products. Interviews conducted across multiple provinces indicate that the structure of this supply chain is

shaped by small farm sizes, localised processing capacity, and the emerging, yet still fragmented, bean-to-bar manufacturing sector.

Interviews indicate that Thailand has favourable climates that support year-round cacao farming, and most cite that their cacao trees are approaching maturity, where most cacao is produced. Farmers 1, 2, 4, and 5 grow cacao under mixed agroforestry systems, intercropping cacao with banana, coconut, or durian trees. Additionally, low capital requirements and low production costs allow smallholder farmers to produce cacao with relative ease. Capital goods such as fertiliser are used sparingly, with it applied only once or twice a year. Several note that they do not utilise hired labour.

Farmer 3 recorded the highest productivity among respondents, with a mean yield of 3.64 kg of cacao per tree, followed by Farmer 2 with 1.75 kg per tree. A notable pattern emerges when yields are examined alongside farm size: farmers managing smaller plantations of approximately 100–200 trees consistently achieve superior per-tree productivity. This aligns with interview evidence indicating that smaller-scale farmers are better able to provide individualised care and more frequent monitoring for each cacao tree, resulting in improved yield performance.

Thai cacao processors have a variety of processing capacities and outputs. Processing capacities start from small-scale operators who ferment 1,300 raw pods every month (Processor 4) to mid-tier processors who process 2,400 kg every month (Processor 1 and 2) to industrial-scale operations led by a leading Thai chocolate company that has the capacity to ferment 40 tons per month (Processor 3). The prices of processed cacao also range from 180 baht/kg for industrial-grade beans to 200-220 baht/kg for premium beans and up to 300 baht/kg for the most premium beans.

The two chocolate producers interviewed demonstrated strong capabilities and precise strategic positioning within Thailand's cacao supply chain. Producer 1 operates as the country's most established vertically integrated bean-to-bar company, producing 700-900 kg of finished chocolate per month and sourcing 1,000-1,200 kilograms of fermented beans directly from its network of over 40 farmers, with plans to scale to 3-5 tons per month through new post-harvest centres. Overall, chocolate producers in Thailand possess strong demand-side strengths with a significant part of output sold B2B. Prices of premium Thai cacao are also high, with B2C prices ranging from 2,000 to 5,000 baht/kg of chocolate, and B2B pricing ranging from 1,400 to 1,800 baht/kg.

5.2 Value-Chain-Analysis Analysis

VCA is calculated by accounting for industry yields of 10:1 for cacao pods to processed beans and interview-reported yields of 10:9 for processed beans to chocolate (Table 2- Table 7).

Table 2. VCA for B2B in Thailand

Stage	VA as % of final share
Farmer pod-sale	6.94
Processor dried bean sale	6.94
Chocolate B2B price (intermediate)	86.11

Table 3. VCA for B2C in Thailand

Stage	VA as % of final share
Farmer pod-sale	5.05
Processor dried bean sale	5.05
Chocolate B2C price (final)	89.9

The values used in this analysis are derived directly from primary interviews with farmers, processors, and producers. As such, the calculations reflect actual field-level efficiency rather than the reported theoretical yields.

Table 4. Vietnam Value Chain (Nguyen and Hussen 2014)

Stage	Value added (USD)	VA as % of final share
Farmer	NA	4.00
Fermentor	0.557	1.08
Marou (manufacturer)	17.99-28.26	34.96 - 54.89
Local retailer:	30.89-20.62	60.0 - 40.05

Table 5. Farmer SWOT

Strength	Weakness
Favourable year-round climate Mixed agroforestry systems Low capital requirements Low production costs Minimal labour use Access to free/low-cost inputs Trees approaching peak productivity	Very small-scale production Price-taking behaviour (8–10 baht/kg) High dependence on the nearest fermentor Inconsistent or absent fermentation Weather-driven yield volatility Pest pressure (squirrels) Poor cost tracking & cashflow management
Opportunities	Threats
Strengthened cooperatives Higher-quality collective fermentation Direct-trade relationships Sustainability/organic differentiation Premium markets for Thai cacao	Overdependence on a single buyer Price volatility and buyer exit risk Climate variability (drought/rain impact) Post-harvest defects from weather Structural lock-in to low-margin pod sales

Table 6. Processor SWOT

Strength	Weakness
Wide range of processing capacities: (1)Small (600 kg/cycle); (2) medium (1,200 kg/cycle); (3)industrial (40,000 kg/month) Diverse market segments: Industrial, Premium, Ultra-premium High selling prices (180–300 baht/kg dried beans)	No standardised fermentation methods Reliance on intuition/experience Inconsistent bean quality Weather-sensitive supply (raw pod fluctuations) Fragmented and decentralised processing network Farmers are limited to the nearest small co-op
Opportunities	Threats
Formal cooperative consolidation Standardised fermentation and QC Cost reduction through centralisation Strong price incentives (180–300 baht/kg)	Fragmented national supply of pods Underutilised capacity during low-yield periods Territorial division between cooperatives Reduced collaboration across processors

Table 7. Producer SWOT

Strength	Weakness
Vertically integrated bean-to-bar model Strong B2B demand High price points (B2C: 2,000–5,000 baht/kg; B2B: 1,400–1,800 baht/kg)	Seasonal shortages Inconsistent fermentation quality Supply constraints limit production Difficult industrial scaling
Opportunities	Threats
Expansion of direct-trade sourcing Deepened farmer partnerships Use of post-harvest centres to standardise fermentation Domestic growth in premium chocolate demand Potential for national quality upgrading	Highly fragmented cacao production base Vulnerability to supply disruptions International competition (e.g., Vietnam's consistent fermented beans) Dependence on smallholder farmers

5.3 Identification of Structural Inefficiencies

Notable inefficiencies found among farmers are primarily driven by their small scale and dependence on weather patterns. Farmers 2 and 3 are small-scale and sell raw pods at 8-10 baht/kg to their nearest fermentors. Farmers sell to their nearest fermentors because transportation is both easy and expensive. Furthermore, none of the non-fermenting farmers have considered fermentation seriously, citing a lack of time, labour, or confidence. Production is highly variable and weather-dependent, and yields can swing dramatically, such as for Farmer 3, who produced 600kg in ideal climates by only 150-200kg in dry conditions. Cost structures and cash flow management are poorly tracked, and farmers rely on informal advice and personal experience rather than structured agricultural management.

For processors, a weakness is the lack of a clear standardised method of fermentation; processors typically rely on intuition, intermittent thermometer use, and informal advice. This results in difficulty in producing consistent beans. Fermentation methods, including turning schedules, differ widely between processors. Furthermore, cooperatives relying on local produce are weather-sensitive, with yields that fluctuate significantly depending on local farmers' yields. This ties into the issue that cacao processing is highly fragmented and decentralised, with most farmers able to sell only to their closest local small-scale cooperative. Processor 1 and Processor 2 are constrained to sourcing cacao pods from nearby farms because pods must be fermented within approximately two days of harvest, and long-distance transport imposes disproportionately high fuel costs. This logistical constraint effectively limits farmers to selling to their closest processor, reinforcing highly localised, fragmented supply chains. By contrast, Processor 3 can source pods from farther regions due to its substantially larger processing volume and access to commercial transport vehicles rather than small pickup trucks.

Both producers interviewed cited high dependencies on the limited national supply of well-fermented beans as a significant inefficiency. Producer 2 reports seasonal shortages of cocoa beans, and one reports issues with inconsistent fermentation quality from processors. Insufficient bean supply and inconsistent production limit output and make industrial scaling difficult.

5.4 Comparison of the Thai value chain with Vietnam

Vietnam was selected as the primary benchmark for this study because its cacao sector is similar in scale to Thailand's and, like Thailand, is not dominated by the global export structures characteristic of major producers such as Ghana and Côte d'Ivoire.

Unlike Thailand, Vietnam's post-harvest system is more structured and formalised, with clearly defined roles for farmers, fermentors, and manufacturers. This organisation provides a relevant blueprint for understanding how coordinated fermentation and supply-chain upgrading can enhance consistency and value capture. The key structural distinction between the two supply chains lies in the number of value-adding stages. Vietnam (Nguyen and Hussen 2014) operates a four-tier system: farmer, fermentor, manufacturer, and retailer. Whereas Thailand's bean-to-bar sector consolidates manufacturing and chocolate production within the same firms, resulting in only two substantive downstream layers.

Even though Vietnam has superior fermentation methods and a more structured supply chain, farmers and fermentors capture only ~5% of the chocolate value, a lower value than Thai farmers and processors (10%). This could show that quality improvements alone do not guarantee an equitable distribution of value. Instead, chain length and Thai downstream firm behaviour heavily determine the distribution of value. This pattern is consistent with broader evidence from cocoa-producing countries. Van Vliet et al. (2021) found that 73–90% of cocoa farming households in Côte d'Ivoire and Ghana do not earn a living income.

5.5 Potential Opportunities for Cacao Supply Chain Improvements

Key opportunities exist for processors, such as consolidating fermentation into formal cooperative or post-harvest centres for chocolate producers, which could standardise quality, reduce costs, and stabilise supply. There are also opportunities for both producers. Both producers can expand direct-trade models, deepen farmer partnerships, and utilise post-harvest centres to standardise fermentation and raise national quality standards. A rise in domestic interest in premium Thai chocolate further provides an opportunity for growth. Producer 1 has recently begun operating its own fermentation centre, a development that substantially enhances its ability to secure a stable and consistent supply of high-quality fermented beans. By internalising the post-harvest process, the firm reduces dependence on external processors, mitigates variability in fermentation quality, and strengthens its overall control over product standards.

5.6 Limitations

This study has several limitations that should be acknowledged. First, the sample size is small and based on non-probability convenience sampling. Respondents were recruited through direct field contact rather than through a structured sampling frame, and no snowball sampling or systematic recruitment strategy was used. As a result, the sample cannot be considered statistically representative of the national cacao sector, and selection bias may be present. The findings, therefore, aim to provide exploratory insight rather than generalisable estimates. Second, much of the quantitative data (yields, costs, prices, and volumes) relies on self-reported figures. Because many smallholders and processors do not maintain formal financial records, some responses are based on recall or rough estimates. This introduces potential measurement error. However, cross-checking across actor groups (farmers, processors, and producers) showed broadly consistent price ranges and value relationships, which supports the internal plausibility of the estimates.

6. Conclusion

This study examined Thailand's cacao value chain through primary field research with 6 farmers, 4 processors, and 2 chocolate producers across multiple regions. The findings reveal that despite favourable growing conditions, low production costs, and increasing domestic demand for premium chocolate, smallholder farmers and processors collectively capture only 5-7% of the final chocolate value. The majority of the value is concentrated downstream, over 85%, and is captured by chocolate manufacturers.

A comparison with Vietnam reveals an important finding: even though Vietnam has better fermentation infrastructure and more structured post-harvest systems, farmers and fermentors there still capture only around 5% of the chocolate value, similar to that in Thailand. This suggests that improving bean quality alone may not be sufficient to increase farmers' incomes, and that value distribution is shaped more by chain length and downstream firm behaviour than by post-harvest quality alone. But currently, Thailand's fragmented processing system makes this worse. Most processors rely on intuition rather than standardised methods, farmers can only sell to their nearest cooperative due to transport constraints, and there are no formal quality standards. These factors limit both bean consistency and farmers' ability to negotiate better prices.

Two main opportunities exist to improve Thailand's cacao sector. First, consolidating fermentation through cooperative post-harvest centres, similar to Vietnam's Fermentor Clubs or the model used in Nan province, could standardise quality, reduce costs, and create a more stable supply. Second, direct-trade partnerships between chocolate producers and farmer networks could ensure consistent sourcing while allowing more value to remain upstream. These interventions focus primarily on improving quality, consistency, and supply stability rather than directly addressing farmer income inequality. By establishing a functional quality system, Thailand can support industry growth and create conditions that may enable future income improvements through mechanisms beyond the scope of this study.

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Biography

Naravid Tejavanija is a senior secondary student at Shrewsbury International School Bangkok, conducting original field research on agricultural supply chains in Thailand. His research focuses on the distribution of value in the Thai cacao sector, examining how smallholder farmers capture value relative to other supply chain actors. Through primary interviews with farmers, processors, and chocolate producers across multiple regions of Thailand, Naravid has investigated post-harvest inefficiencies and structural barriers to equitable value distribution.