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True (Cost) Prices in the Supply Chain of Coffee
A Sustainable Supply Chain Finance View

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Abstract

In this article, the coffee supply chain is studied from the perspective of small and medium-sized enterprises (SMEs) to determine the true (cost) price of coffee in a sustainable supply chain from a financial perspective (supply chain finance).
Besides mapping the supply chain from Latin America to the Netherlands, the distribution of five SME coffee distributors in the Netherlands is studied (using the case study method).
For the supply chain as a whole, the true (cost) prices are estimated using two techniques of true (cost) pricing: shadow pricing (supply) and willingness-to-pay (demand).
Sustainability of coffee production, storage, transport, packaging, and consumption in the supply chain involves many aspects.
Monetising the costs of externalities and ensuring fair prices (e.g., income/wages for farmers) is a complex matter; this study is perhaps a (first) step toward further research on this topic.

Keywords

True Costs, True Cost Price, True Price, Fair Price, Supply Chain, Coffee, Supply Chain Finance, Sustainability, Circularity, Circular Economy, Rhineland Business Model, Full Costing, Absorption Costing

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Introduction

This research has been a journey of a few years, and started with the research project (HAN University) of the coffee supply chain in Vietnam with Le (2021) and Nguyen (2021), Coffee projects at Windesheim (Guelfi, et al., 2023) and KdG (Bucciono, et al., 2023).
In Appendix I, a historical 'supply chain' (double trade triangle) for tropical products is provided (Speerstra, Ensing, & De Jong, 1974), which was common in the history of colonial trade patterns during the VOC period (Reinders & Wijsenbeek, 1994). In the current coffee supply chain, we still recognise those historical influences (Kuepper & Kusumaningtyas, 2020).
In Figure 1, the essential issue in the coffee supply chain is that, based on traditional cost prices, the farmer receives about 2% of the retail price for 1kg of coffee. This 2% is probably not only a fair price for the farmer's income, but also not a good compensation for the environmental costs of producing coffee.

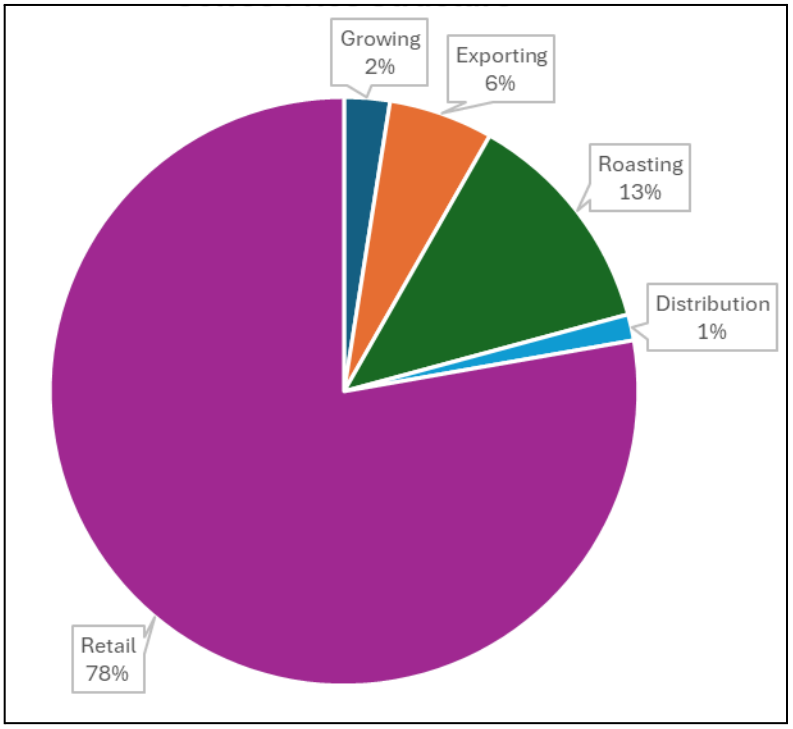

Figure 1 Cost price structure in the coffee supply chain (developed by the author, based on several sources)

In Figure 2, a traditional microeconomic (Perloff, 2014) graph has been plotted to determine the market price at the market equilibrium (P*), along with the consumer surplus and producer surplus (Black, Hashimzade, & Myles, 2017). If we introduce the environmental and social costs, the supply curve shifts horizontally to the left, resulting in a new market equilibrium. The new equilibrium price (P^{**}) is the fair price of coffee, with a smaller consumer surplus (willingness to pay) and a higher producer surplus (the old one and the value of social and environmental costs). The market as a whole will have a small deadweight loss (DWL), and producers will have a minor loss in their original producer surplus.

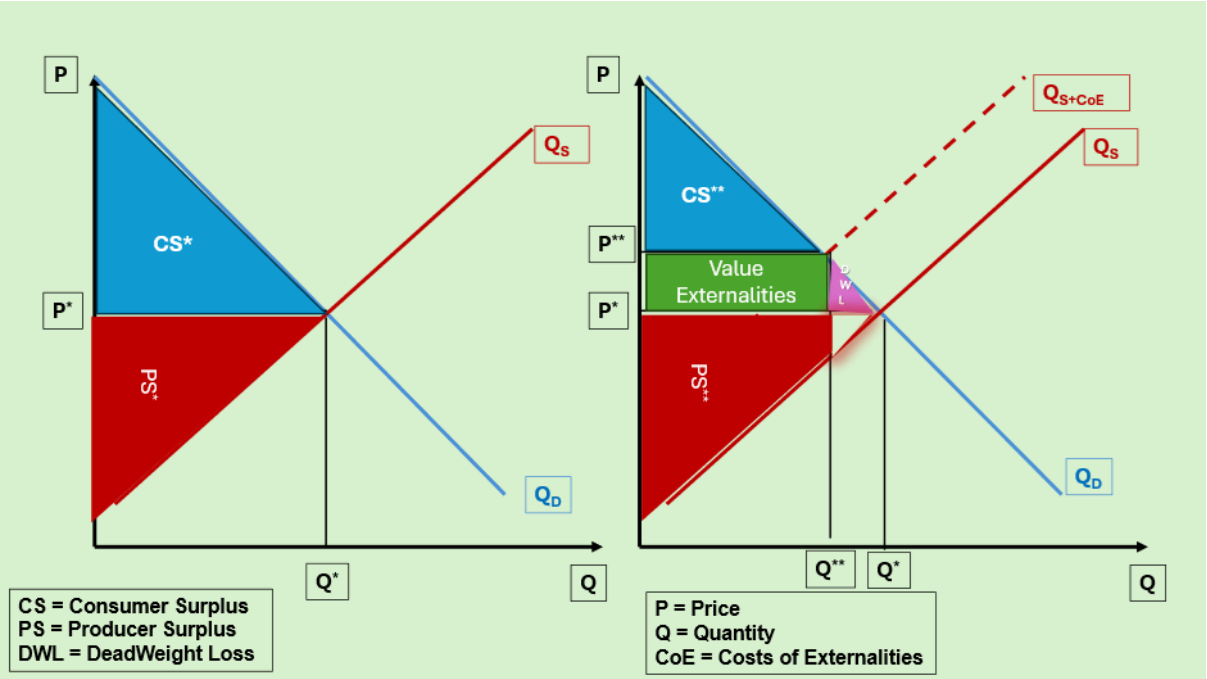

Figure 2 Pricing and True Pricing on the coffee market (developed by the author)

Unfortunately, the coffee market is not yet operating like this. However, there are some experiments with true pricing (True Price, 2025a) in the coffee market and, more generally, in the market (True Price, 2025b).
In the coming sections of this article, the coffee market, true cost price, supply chain of coffee, supply chain finance, results, and case studies will be discussed. Finally, the article will conclude with (first) conclusions and a discussion of further research.

Coffee market

The coffee market is characterised by, for instance, several reports of the International Coffee Organisation (ICO, 2023) and the overview of the Global Coffee Sector Supply Chain (Ono, 2019). The coffee price is highly volatile over time, as shown in Figures 1 and 2.

Figure 1 Coffee price Arabica (US Cents per pound), source: IMF (FED St.Louis, 2025)

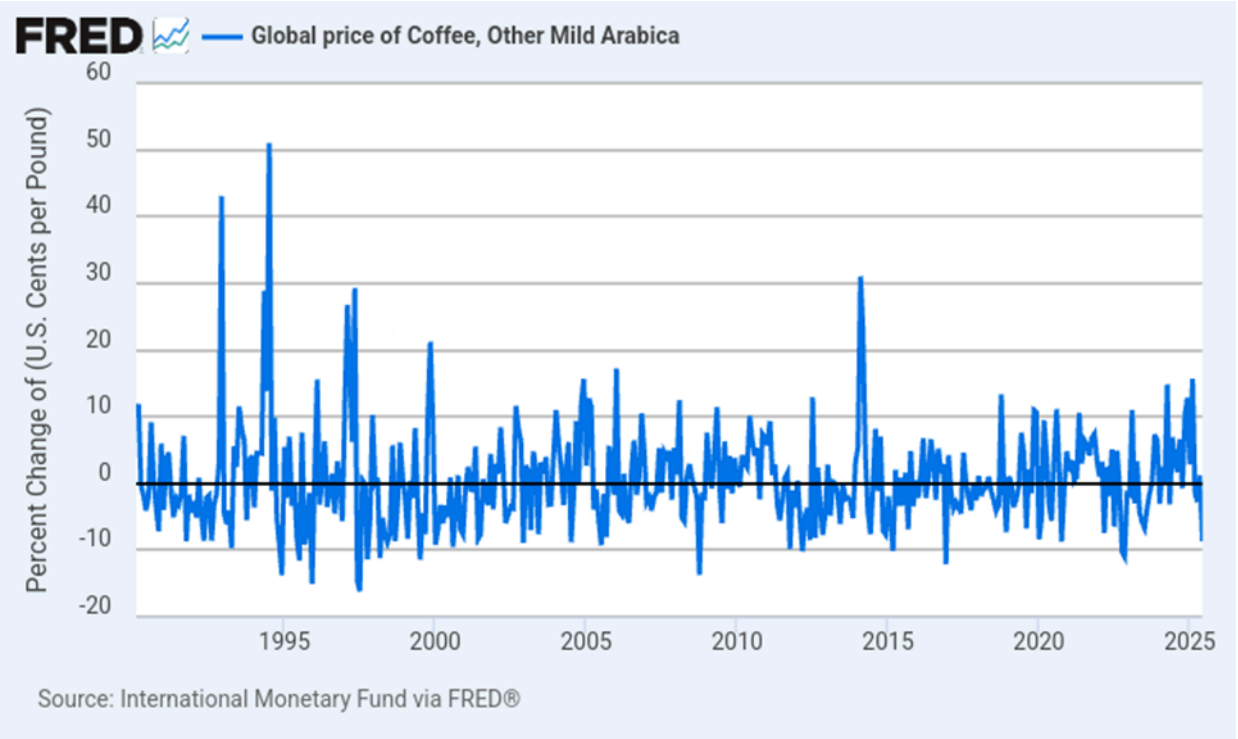

Figure 2 Price volatility of coffee (FED St.Louis, 2025)

Especially for the farmers, this price volatility has a huge impact on their family incomes. Price risk-covering methods, such as using coffee futures contracts, are not used by farmers; therefore, they are very exposed to price fluctuations in the coffee market (and to exchange rate risk between the US $ and their local currencies under current contracts).
The coffee price structure, as shown in Figure 1, is also not much in favour of the coffee farmers, as studied by the Financial Times (2019) and the Visual Capitalist (2025): Of the final coffee price, the farmers receive about 2%.

True cost price

The true cost price is defined as:

Full cost price	**€ 14.00**
Environmental costs*	**€ 3.00**
Social costs*	**€ 2.00**
True cost price	**€ 19.00**

We can calculate the True Cost Price (compared to the Traditional cost price under Full costing or Absorption costing) for 1 kg of coffee beans and include the environmental and social costs (Horngren, Datar, & Rajan, 2012).
The price gap of € 5.00 between the true cost price and the traditional cost price consists of the valuation of environmental externalities and the fair value of labour costs. In the above example, the environmental costs and social costs are assumed/estimated (*) by the author, inspired by using true price techniques (as plotted in Figure 3). The True Price Organisation has several studies in related fields (True Price, 2014) and this field (True Price, 2025a). Also,

the case study in Colombia (Brounen, De Groot Ruiz, Isaza, & Van Keeken, 2019) offers interesting insights into the valuation of externalities.

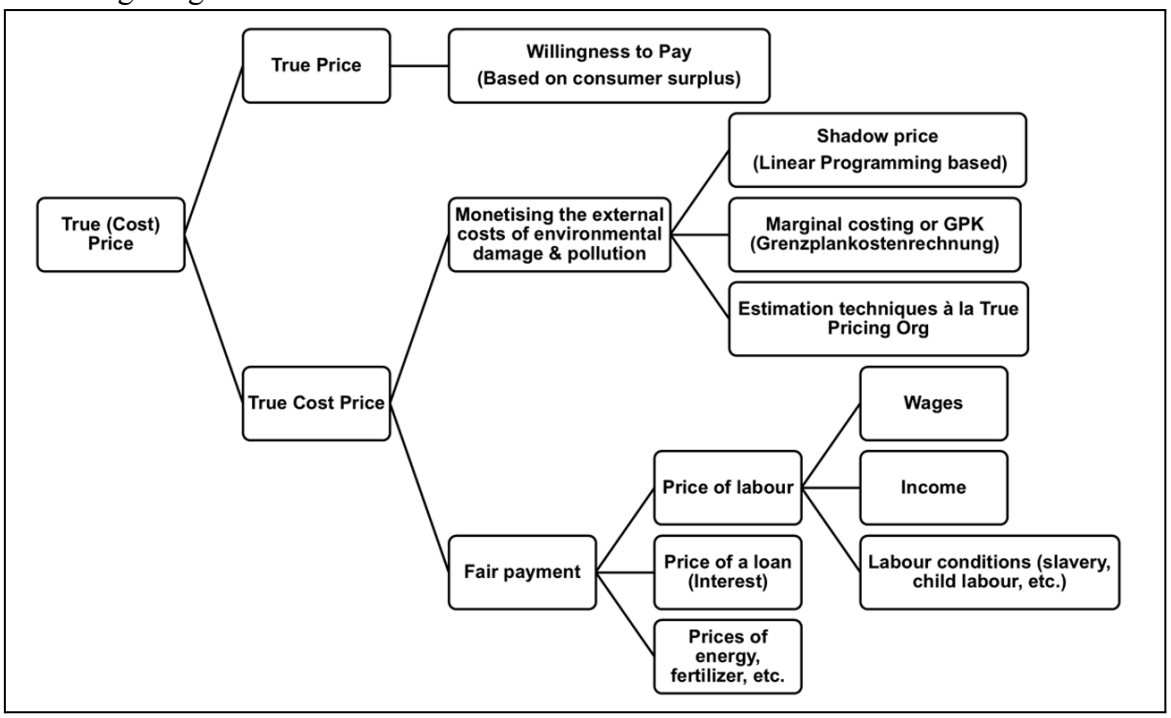

Figure 3 Overview of True (Cost) Price, developed by the author and inspired by (Jansen, 2024)

Based on research on true cost prices in other industries (Jansen, 2024), Figure 3 has been developed, as well as influenced by the *Handbook of Environmental Prices* (DeVries, et al., 2025), to monetise externalities using the technique of shadow pricing (Calculating the Lagrange multiplier - λ - (Bradley, 2015)). The complexity of the price gap (the difference between the true price and the market price) is quite well summarised by the True Price Organisation in Figure 4 and by the *Valuation Framework for True Price Assessment of Agrifood Products* (Galgani, Woltjer, De Adelhart Toorop, & De Groot Ruiz, 2021)

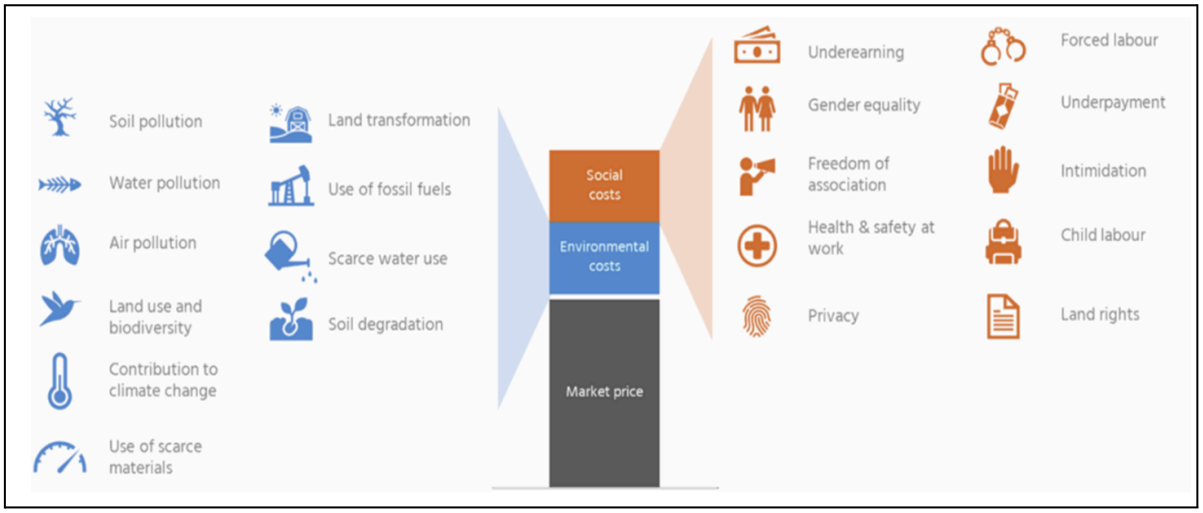

Figure 4 True price components (True Price, 2025b)

Supply chain of coffee

The supply chain of coffee has been summarised and simplified by the author in Figure 5, and is based on the research project (see Appendix II) of Nguyen (2021) and Le (2021). The complexity of the supply chain is driven by many factors, including transport modes, packaging, sustainability, circularity, operational exchange rate exposure, value flows, information flows, physical flows, and coffee price volatility. It is, of course, impossible to include all aspects in a supply chain diagram, as plotted in Figure 5. However, we have to keep in mind the complexity noted above, especially regarding issues such as distributed ledger technology (DLT or Blockchain) and supply chain finance.

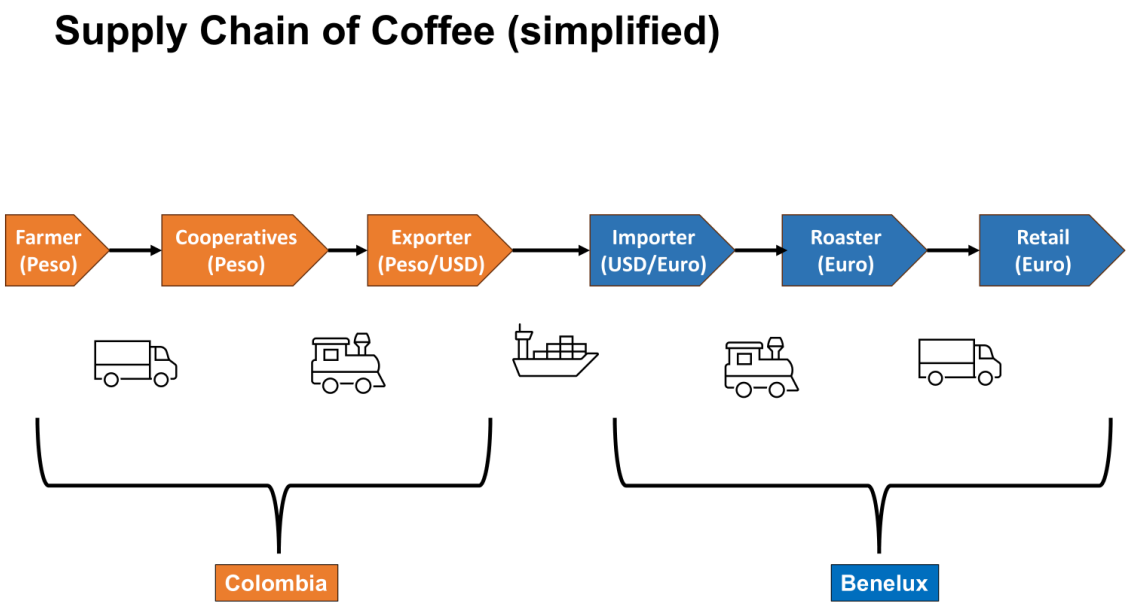

Figure 5: Supply chain of coffee between Colombia and the Benelux, developed by the author

Supply Chain Finance

The goal of supply chain finance is to improve supply chain liquidity in two ways: static liquidity and dynamic liquidity (Steeman, 2014). Both approaches are to improve the net operating working capital (NOWC) position in each part of the supply chain. Static liquidity can be seen as the NOWC position: Debtors (AR) + Inventories – Creditors (AP), while dynamic liquidity can be operationalised as: DSO + DIO – DPO (see Table 1 for the formula).

Days in Sales Outstanding (DSO)	$DSO = \frac{Debtors\ (AR)}{Revenues} * 365\ days$
Days in Inventory Outstanding (DIO)	$DIO = \frac{Inventories}{COGS} * 365\ days$
Days in Purchases Outstanding (DPO)	$DPO = \frac{Creditors\ (AP)}{COGS} * 365\ days$

Table 1 Formulas for dynamic liquidity, developed by the author (COGS = Cost of Goods Sold)

An overview of supply chain finance instruments was developed by De Boer, Steeman & Van Bergen (2015) and subsequently adjusted by the author (Jansen, 2024).

- Strategic (CAPEX: Equity related)
  - Take-over / Merge
  - Joint venture
  - Minority interest
- Tactical (CAPEX: Fixed asset financing)
  - Equipment financing
  - Pay on production
  - Vendor leasing
  - Supplier subsidies
- Operational (OPEX)
  - Reverse factoring
  - Factoring (added by the author)
  - Dynamic discounting
  - Inventory financing
  - Purchase Order Financing
  - Crop financing (added by the author)
  - Pipeline inventory financing (added by the author)
  - Embedded Finance (added by the author)
  - Trade finance instruments (added by the author)
    - Letter of Credit (LC)
    - Bank Guarantee
    - Documentary credit
    - Bank payment obligation (BPO)

In Appendix III, an overview of a supply chain finance model has been developed (Jansen, Kaledinova, & Wolter, 2022) using a firm-level input-throughput-output model for an SME, especially buying, producing and selling activities, which are the central issues in value flows in a company (and how to finance them).

At each stage of the supply chain, there is a need for financing (Henke, 2025), a financial instrument (such as pre-financing), and a credit transfer. The trade finance bank, as well as domestic banks, plays an important role in facilitating financial transactions, providing liquidity in the chain and backing the real flow of goods (in this case: coffee). In Figure 6, Henke summarises this (the author translated the original from German into English and adjusted a few aspects of the original publication).

Crop financing is another phenomenon in agricultural supply chains (Hollinger & Gross, 2019), and thus also a possibility in the supply chain of coffee for the focal company to facilitate this instrument for the farmers (See Figure 7).

Another topic is the discount rate to be charged for several supply chain finance instruments, such as reverse factoring. Normally, payment terms are 60 days (domestic) and 90 days (international). A discount is offered for payment within 10 days. The discount rate is for early payment of 60 – 10 = 50 days or 90 - 10 = 80 days. Assume the discount rate is 2%. Then the effective annual rate (EAR) will be 15.9% for 50 days and 9.7% for 80 days. At a discount rate of 5%, the EAR will be 45.4% for 50 days and 26.4% for 80 days. To calculate the EAR, the following formula (Brealy, Myers, & Allen, 2020) has been used:

$$EAR = \left\{\left(\left(1 + \frac{d}{100-d}\right)^{\frac{365}{PT-EP}}\right) - 1\right\} * 100\%$$

Symbols that have been used:

- PT = payment term (e.g. 60 or 90 days),
- EP = earlier payment (e.g. 10 days),
- d = discount percentage

For the interest rate of the focal company (which often leads to the use of SCF instruments), the weighted average costs of capital or WACC (Brealy, Myers, & Allen, 2020) is often used, as the discount rate is based on the WACC with some mark-ups for currency and other risks (Schoenmaker & Schramade, 2023).

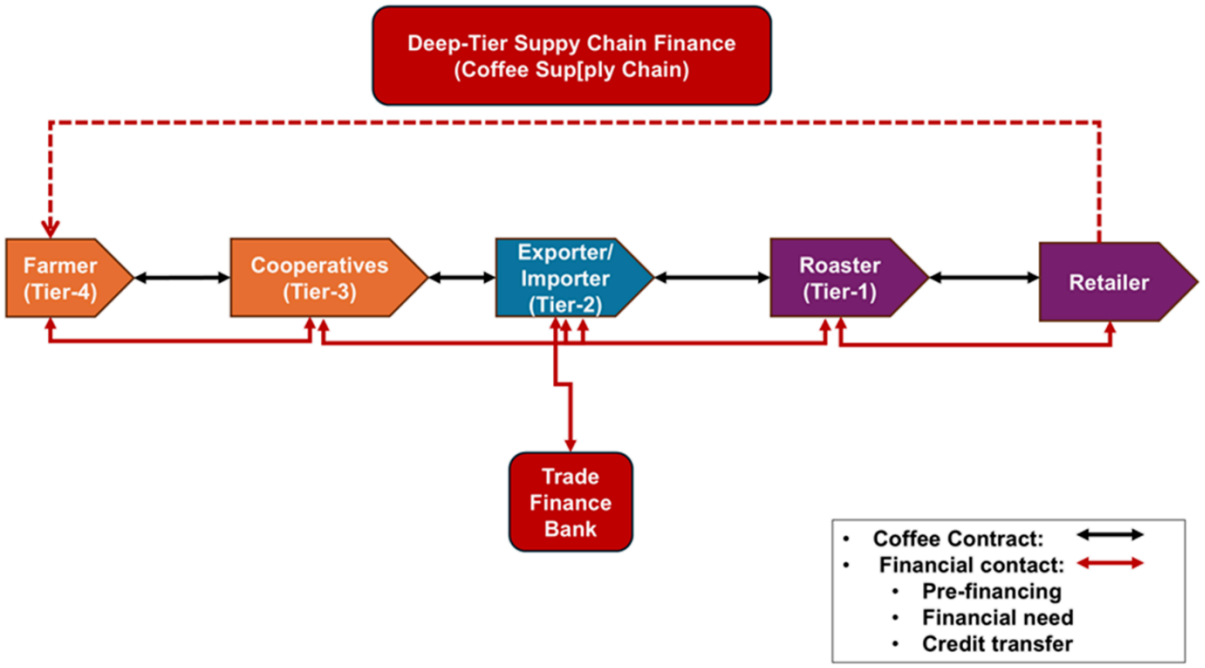

Figure 6 Deep-Tier Supply Chain Finance in the coffee supply chain based on Henke (2025)

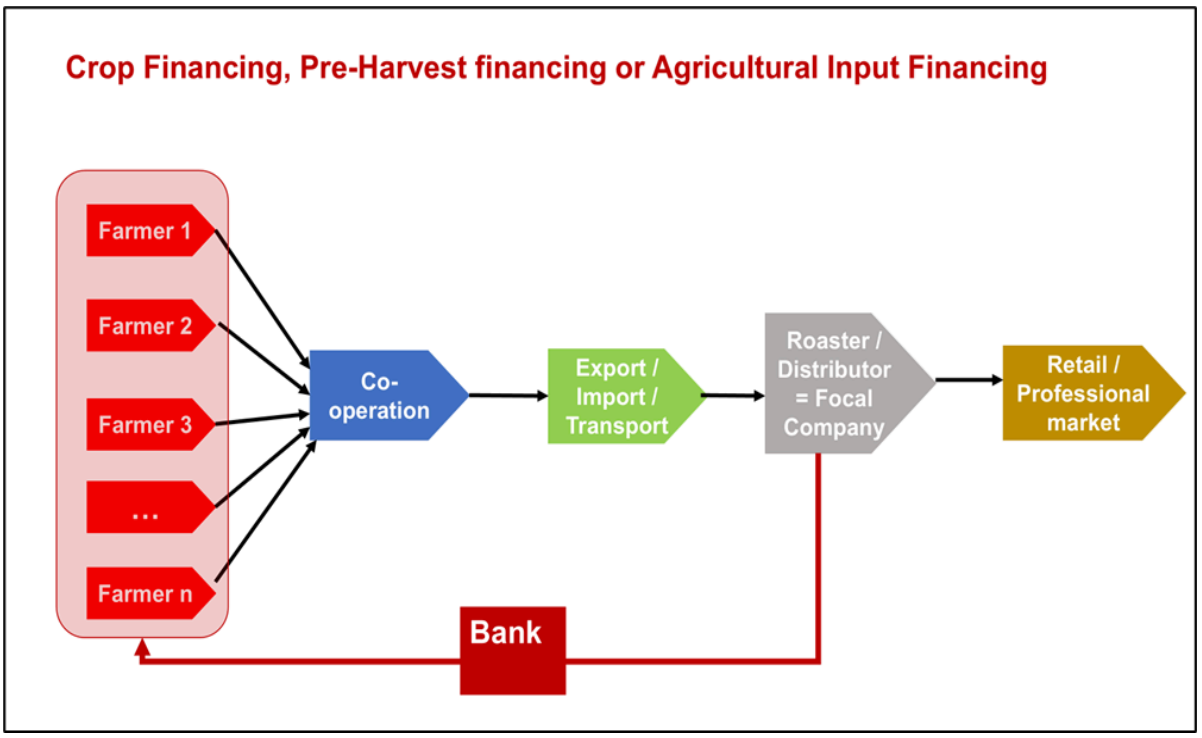

Figure 7 Crop financing in agriculture, developed by the other

Supply chain finance is traditionally influenced by corporate finance (Brealy, Myers, & Allen, 2020), but is for the last decade now including sustainable thoughts as presented by Roncalli (2024) and Schoenmaker & Schramade (2023), especially long-term impact and non-financial value (like Social value and Environmental value) are getting more and more focus in sustainable supply chain management (Martins, 2025) and sustainable supply chain finance (Liao, Prataviera, Ghadge, & Abushaikha, 2025).
Also, the role of information technology (IT), such as developments in cloud technology and distributed ledger technology (DLT or Blockchain applications), must be taken into account so that farmers are connected to their focal company in the coffee supply chain (ProFound, 2025).
The coffee supply chain and its supply chain finance have at least five perspectives (Jansen, 2024), in a world that is characterised as VUCA (Volatile, Uncertainty, Complexity and Ambiguity) or BRANI (Brittle, Anxious, Non-linear and Incomprehensible). In Figure 8, the five SCF perspectives have been summarised in general and specifically for the coffee supply chain from farmers to retailers.

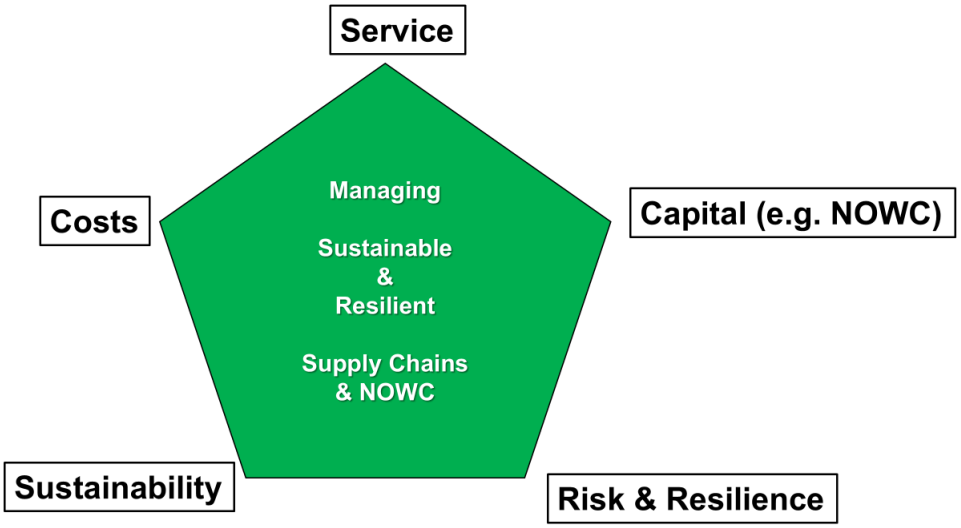

Figure 8 SCF perspectives, developed by the author (Jansen, 2024) and based on Ebel et al. (2022)

Results

Traditional supply chain finance (Pfohl & Gomm, 2009) was very much focusing on the improvement of financial flow between the focal company and the suppliers (Tier-1 and Tier-2), in more recent contributions (Jansen, 2024) there is not only a link with the suppliers, but also to IT-platforms, whether or not linked to a bank in a Fintech construction (See Figure 9)

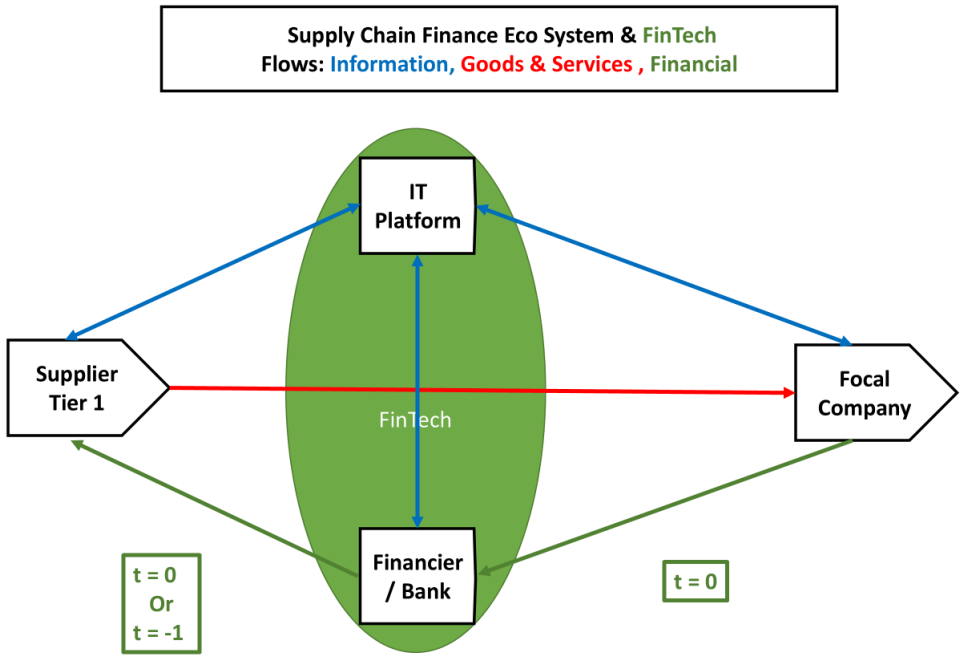

Figure 9 Supply Chain Finance Perspectives. Developed by the author (Jansen, 2024)

As already mentioned (See Figure 9), Supply Chain Finance not only focuses on the financial flows between the focal company and its supplier network, but also focuses on sustainability and resilience in a VUCA & BANI world. Trading platforms like TraxeX might be the solution to track and trace coffee from producer to consumer, and also to make the true price in the supply chain more transparent (TraceX, 2025).
In Figure 10, we can observe a possible framework for calculating a true price in the supply chain. As we can conclude from Figure 8, the true price gap at the retail is: € 26.92 - € 18.33 = € 8.59; this is also the amount of the assumed (*) costs of the externalities (€ 0.50 + € 0.40 + € 1.75 … + € 0.90 = € 8.59). So, for 1kg of coffee beans at the supermarket, we should pay €8.59 more than we are used to. The actual price in the supermarket is based on actual retail prices in the Netherlands; the true price is based on the average price of coffee speciality stores in the Netherlands (small-scale roasters).
This framework is based on input from many discussions and a literature review on true prices (Jansen, 2024) and on coffee certification (Kuepper & Kusumaningtyas, 2020). It will perhaps serve as input for further discussions and, hopefully, for implementing it in Cloud/DLT applications in the coffee supply chain.

	1 kg of (roasted) beans	Costs in €	Actual Price	AP in %	True Price	TP in %
Farmer	Actual Coffee Selling Price (CIF)	€ 0,50	€ 0,50	3%	€ 3,33	12%
	Damage costs deforestation*	€ 0,50				
	Damage costs irrigation*	€ 0,40				
	Add-up fair wages / income*	€ 1,75				
	Damage costs packaging*	€ 0,08				
	Damage costs local transport*	€ 0,10				
Cooperatives	Actual Coffee Selling Price (CIF)	€ 0,95	€ 0,95	5%	€ 4,83	18%
	Damage costs packaging*	€ 0,10				
	Damage costs local transport*	€ 0,15				
	Add-up fair wages transport*	€ 0,80				
Exporter	Actual Coffee Selling Price (CIF)	€ 1,30	€ 1,30	7%	€ 6,04	22%
	Damage costs packaging*	€ 0,01				
	Damage costs local transport*	€ 0,10				
	Add-up fair wages transport*	€ 0,75				
Importer	Actual Coffee Selling Price (CIF)	€ 2,10	€ 2,10	11%	€ 7,49	28%
	Damage costs packaging*	€ 0,15				
	Damage costs local transport*	€ 0,20				
	Add-up fair wages transport*	€ 0,30				
Roaster	Actual Coffee Selling Price (CIF)	€ 4,50	€ 4,50	25%	€ 11,44	42%
	Damage costs packaging*	€ 0,70				
	Damage costs local transport*	€ 0,85				
Retailer	Actual Coffee Selling Price (CIF)	€ 18,33	€ 18,33	100%	€ 26,92	100%
	Damage costs packaging*	€ 0,75				
	Damage costs local transport*	€ 0,90				

Figure 10 True cost price matrix in the coffee supply chain (developed by the author)

Case studies of SMEs coffee distributors in the Netherlands

Empirical data of true prices in the coffee supply chain can be obtained from several sources, such as the International Coffee Organisation (ICO, 2023), True Price Organisation (True Price, 2014) (True Price, 2025b), Handbook of Environmental Prices (DeVries, et al., 2025), and of annual reports of multinational companies like Nestlé (2025) and Jacob Douwe Egberts Peets (2025). Nestlé and JDE-Peet's are dominating the Dutch coffee market in supermarkets. Figure 11 provides an overview of the Dutch coffee market.

Figure 11 Coffee market actors in the Netherlands (Kuepper & Kusumaningtyas, 2020)

Several case studies of Dutch SMEs importing, roasting and distributing coffee, the following SMES were studied:

I. Peeze-Arnhem (Peeze, 2025a) (Peeze, 2025b)
II. De Pelikaan-Zutphen (Pelikaan, 2025)
III. CoffeeMeister-Almelo (CoffeeMeister, 2025)
IV. TUKA-Nijmegen (TUKA, 2025)
V. Koffie Jongens (De Koffiejongens, 2025)

Qualitative data from these case studies were obtained from their websites and from direct, personal communication with the author. As in all applied research (Saunders, Lewis, & Thornhill, 2003), the time limitation made a more in-depth analysis impossible, and the company policy required a follow-up to fill the model (Figure 10) with quantitative data.

Conclusion and discussion

The True Costs of coffee are not easy to calculate in the coffee supply chain, because it is not easy to monetise the environmental and social costs across the entire supply chain. For instance, the environmental costs during production, transport, and packaging are difficult to monetise (and sometimes quite arbitrary). Similar examples can be provided for monetising social costs (cheap labour, poor labour conditions, etc.). Which externalities should be taken into account? What precisely is the difference between direct and indirect externalities?
The (true) price structure is not very transparent for the final consumer and the original producer (farmer). Suppliers of coffee in the northern hemisphere behave de facto like a focal company, so they should be able to map the price structure in the supply chain. For unclear (commercial) reasons, they are not transparent concerning the true price of coffee.
Fintech and DLT platforms might be a solution to a sustainable coffee supply chain. In order to make the journey of coffee in the supply chain more traceable, provide an overview with

true prices of coffee in the supply chain, and provide fair liquidity instruments to improve net operating working capital positions (especially for farmers).
So the research on true costs and true prices in the sustainable coffee supply chain will surely have follow-ups in the years to come.

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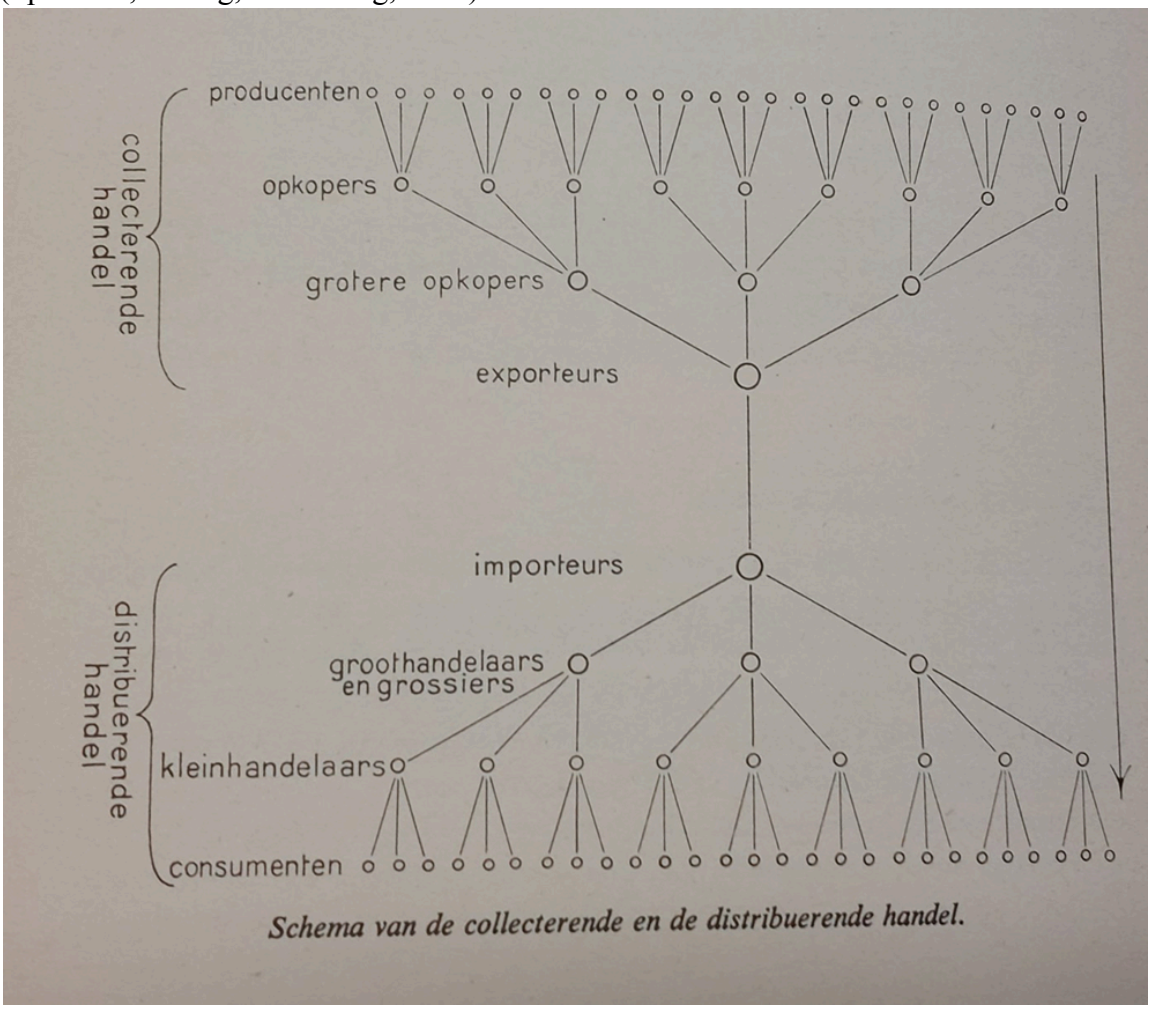
Appendix I: Traditional patterns in agricultural products: The Double Tarde Triangle (Speerstra, Ensing, & De Jong, 1974)



Schema van de collecterende en de distribuerende handel.

International trade of agricultural products:

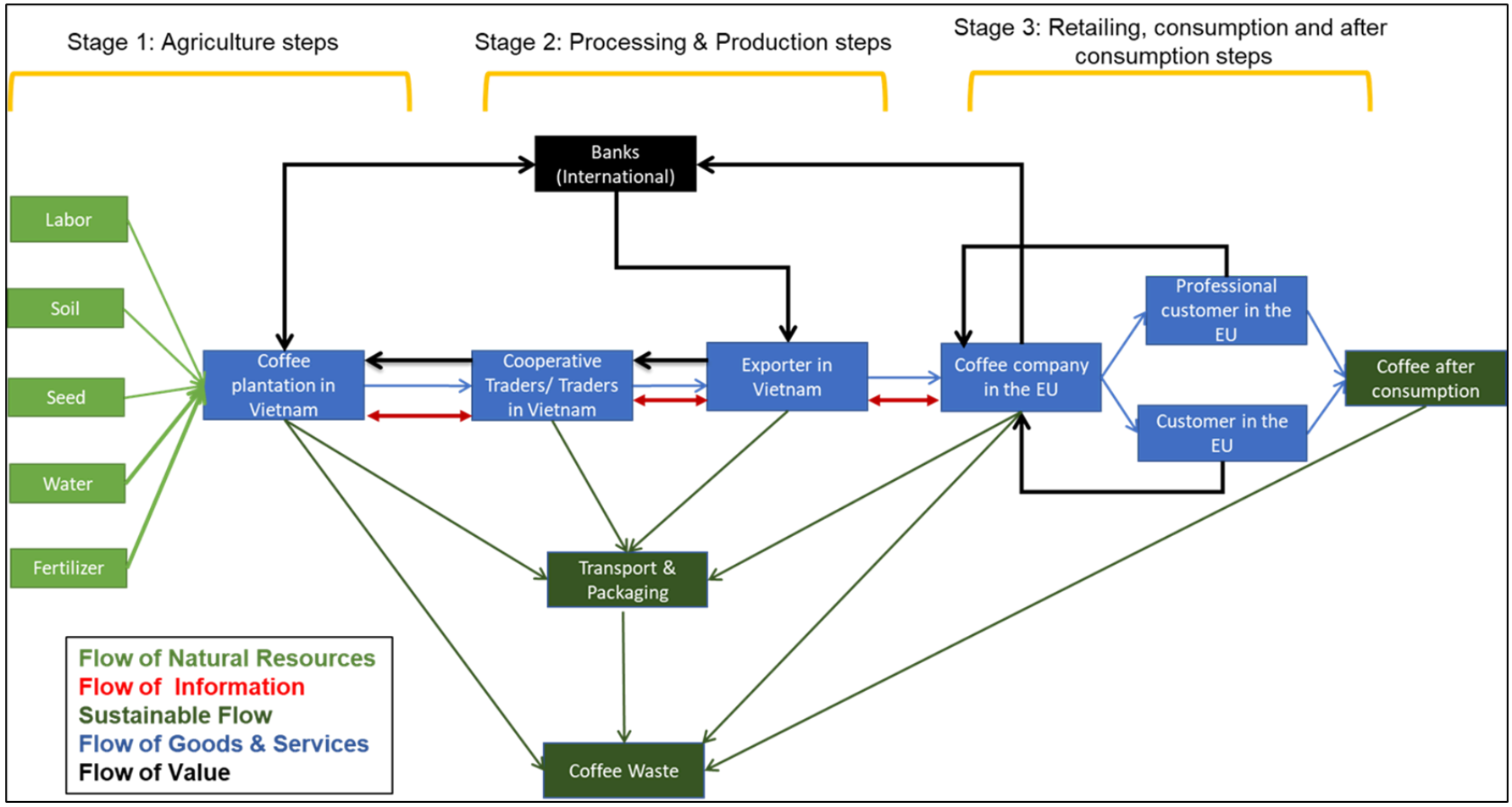
- **Collecting trade**
  - **Producers**
  - **Local buyers**
  - **Wholesale buyers**
  - **Exporters**
- **Distributing trade**
  - **Importers**
  - **Wholesalers**
  - **Retailers**
  - **Consumers**

Amsterdam Staple Market of VOC (17th & 18th century):

- **Storage in Warehouses**
- **Transhipment to the European hinterland**

(VOC = Dutch East India Company)

Appendix II Sustainable supply chain of Coffee, research project of Nguyen (2021) **and Le** (2021)



Appendix III Supply Chain Finance at the firm level , developed by the author (Jansen, Kaledinova, & Wolter, 2022)