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CHAPTER 4

Governance and Sustainability in Cocoa and Orange Agro-Food Systems

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INTRODUCTION

Agrifood systems have taken on various forms due to the number of agents involved and their locations, influenced by practices of proximity to the consumer, technological advancements, logistics, among other factors. All these systems, whether characterized by high-quality attributes or commoditization, require governance systems that entail proper transaction management, impacting economic, social, and environmental levels. This chapter aims to discuss how governance established in productive systems has contributed to the sustainability of supply chains. It includes an analysis of the productive systems of oranges and cocoa.

The conceptual approaches and methodological procedures involved analyses of Transaction Cost Economics (transaction characteristics, agent characteristics, and governance) and Sustainability, as well as two case studies: a) a cooperative of small orange producers in the interior of São Paulo state, Bebedouro (SP). The research subjects were 29 cooperative members and a representative of the analyzed cooperative⁴, in June 2019; b) a case study involving certified cocoa producers located in the southern region of Bahia state during 2016 and 2017, and processing companies that trade for export and the domestic market. This case study included six producers (organic certification), a Collective Organization (CO), and a Buying Processing Company (BPC).

The evidence presented in this chapter contributes to achieving the United Nations (UN) Sustainable Development Goal (SDG) number 12, aiming to ensure sustainable consumption and production patterns.

In terms of structure, the next sections of this chapter discuss coordination and governance aspects in high-quality systems, the agrifood systems of oranges and cocoa, with respective case studies presented and analyzed, followed by final considerations.

⁴ Inferential statistical techniques were used for data collection and general analysis, beginning with a statistical procedure to determine the sample size for qualitative variables to select the exact number of participating cooperatives.

COORDINATION IN HIGH-QUALITY SYSTEMS

National and international literature has been depicting coordination aspects of systems and governance forms concerning differentiated and certified agricultural products. Ménard (2022) contributes to the topic by stating that cooperation between distinct partners and competitors can be achieved through low-cost coordination, without losing the advantage of decentralized decisions, maintaining autonomy and transactional interdependence. This is made possible by utilizing hybrid governance forms and aligning them with the types of transactions conducted.

Ménard (2004, 2013) and Aguiar (2020) assert that hybrid transactions, an intermediate form, have multiplied and are much more common compared to market or hierarchy transactions. The growing literature on this mode of governance indicates increased interest in the surrounding issues. According to Ménard (2004, 2013), the significant role of these arrangements in shaping and monitoring economic activities will likely continue to generate a flow of theoretical models and empirical studies from academia, where hybrid organizations are considered “institutional production structures” and deserve attention from scholars in the field.

There is a common understanding of the “market” concept where supply and demand mechanisms play a central role, and price is the most important factor in regulating aspects such as adaptation. Similarly, the “hierarchy” concept represents the central role of the firm, with vertical decision-making and necessary internal adjustments. However, the concept of hybrid governance is not stabilized and can involve different formats such as clusters, networks, strategic alliances, franchises, symbiotic arrangements, supply chains, administered channels, joint ventures, non-standard contracts, among others (Aguiar, 2020; Ménard, 2004; Ménard, 2022).

Regarding empirical contributions on hybrid formats, Marchini *et al.* (2020) show how regulation and contractual freedom act as drivers for food safety investments, such as traceability and certification, in the Italian

meat sector. Wever *et al.* (2010) investigated the relationship between quality management systems among firms and the governance structures between them, suggesting that misalignment between these spheres can result in high transaction costs.

Following this, the chapter presents how the established governance in production systems has contributed to sustainability in the analyzed cases.

THE ORANGE AGRIFOOD SYSTEM

Brazil stands out as the world's leading supplier of orange juice, responsible for 34% of global orange production and 61% of global juice production, with 95% of the total destined for exports (Citrusbr, 2019; Neves; Trombin, 2017). In 2021, the country reached a production of 16 million tons, nearly double that of the second place, India, followed by China, Mexico, and the United States (FAO, 2023).

Orange production for industrial processing in Brazil is concentrated in the citrus belt, an area extending through the state of São Paulo, part of the Triângulo Mineiro, and the southwest of Minas Gerais (Citrusbr, 2019).

According to Stuchi, Girardi, and Moreira (2021), several aspects affect the sustainability and competitiveness of citrus production in Brazil, including phytosanitary issues like Huanglongbing (HLB), which require proper management for control; climatic adversities and the need for management techniques and plant selection; growing demand for differentiated, sustainable, and agroecological products; and the intensification of technology use, such as precision agriculture.

Both citrus farming and industrial juice processing activity involve significant investments in specific assets, exposing parties to opportunistic renegotiation actions in transactions between citrus growers and juice processors (Aguiar, 2020; Ito, 2014). For example, an analysis process of a cartel formed by processing companies was concluded in November 2016, confirmed by the Administrative Council for Economic Defense (CADE).

In 2023, the companies were sued by the Federal Public Ministry, in conjunction with the Federal Court of São Paulo, with a demand for R\$12.7 billion in fines (Brito, 2023).

ORANGE CASE STUDY

For strategic reasons related to market positioning and branding, since 2017, an agricultural cooperative⁵ decided to focus its sales solely on Fairtrade-based commercialization⁶. O principal – e único – produto comercializado no ano de 2019 foi a laranja *in natura*, que respondeu por 100% das vendas da entidade, sendo comercializada integralmente no nível regional para uma empresa processadora de grande porte, em suas sedes nas cidades do interior paulista, por meio da entrega direta do agente cooperado à processadora e sob intermédio e negociação da cooperativa (Aguiar, 2020; Aguiar *et al.* 2021).

The main – and only – product sold in 2019 was fresh oranges, accounting for 100% of the entity's sales, entirely marketed regionally to a large processing company in São Paulo's interior, through direct delivery by the cooperative member to the processor and mediated by the cooperative (Aguiar, 2020; Aguiar *et al.* 2021).

Box 1 presents the general parameters used regarding the levels of analysis concerning transaction characteristics and agents in the case in question. The investment degree in orange production by the cooperative member to supply the cooperative was classified as high, including land preparation, use of implements, fertilizers, and specific systems to meet the fruit's contractual specifications (Aguiar, 2020; Aguiar *et al.* 2021). Thus, it can be said that the specificity of the asset (orange) transacted between the cooperative member and the cooperative is classified as high. This verification is based on the degree to which the orange can be used for

⁵ The cooperative was founded in 2012 and includes 90 citrus growers.

⁶ Fairtrade is a third-party certification based on a partnership relationship between producers and consumers, enabling the improvement of living conditions and future planning for producers (Fairtrade International, 2023).

alternative purposes, such as direct supply to wholesale/retail markets and fairs, without losing its value, according to Williamson (1991) and Tadelis and Williamson (2013) *apud* Aguiar (2020); Aguiar *et al.* (2021) (Box 2).

The uncertainty involved in the transaction is classified as low, both from the perspective of the cooperated members selling oranges to the cooperative and from the cooperative's perspective in acquiring oranges from the members. This is due to the high level of knowledge by the members about the supply, demand, and price of oranges, the cooperative's social statute, and the cooperative's behavior in purchasing oranges. Similarly, the cooperative has a high level of knowledge about the supply, demand, and price of the fruit, the social statute, prevailing rules and laws, and the members' behavior in selling oranges to the cooperative.

Box 1 – Parameters of the Levels of Analysis Regarding Transaction and Agent Characteristics for the Selected Case

Parameters	Low	Medium	High
Asset Specificity	Use of simple planting and harvesting.	Use of land preparation, implements, fertilizers, and general systems.	Use of land preparation, implements, fertilizers, and specific/exclusive systems.
Uncertainty	High knowledge about the economic environment (supply, demand, and price of oranges), institutional environment (cooperative's social statute, current rules, and laws), and behavioral environment.	Medium knowledge about the economic environment (supply, demand, and price of oranges), institutional environment (cooperative's social statute, current rules, and laws), and behavioral environment.	Low knowledge about the economic environment (supply, demand, and price of oranges), institutional environment (cooperative's social statute, current rules, and laws), and behavioral environment.
Frequency	Sporadic and irregular supplies (e.g., spot, occasional).	Interval and somewhat regular supplies (e.g., alternate crops).	Regular supplies (e.g., every crop).

Opportunism	Low frequency of self-interest (market information distortion and contract breach) by the principal.	Medium frequency of self-interest (market information distortion and contract breach) by the principal.	High frequency of self-interest (market information distortion and contract breach) by the principal.
Limited Rationality	High frequency of use of market information (price, supply, and demand of oranges) and managerial information (costs, stock, technology).	Medium frequency of use of market information (price, supply, and demand of oranges) and managerial information (costs, stock, technology).	Low frequency of use of market information (price, supply, and demand of oranges) and managerial information (costs, stock, technology).

Source: Aguiar (2020) and Aguiar *et al.* (2021), based on Williamson (1991, 2012), Balestrim and Arbage (2007), and Tadelis and Williamson (2013).

Box 2 – Characterization and governance structure of the orange case study

Type	Producer Scope	Cooperative Scope
Characterization	Quantity: 29 producers; Classification: Small producers; Number of Properties: 1 per producer; Time in Activity: More than 40 years; View on Activity: Unstable (due to prices, pests and diseases, and production costs); Means of Survival: Cooperativism and Fruit Growing; Main Production Destination: CL	Year of Foundation: 2012; Number of Members (citrus farming): 90 producers; Product: Fresh oranges; Certification: Fairtrade; Production Destination: Processing industry.
Commercialization and Governance	Main Buyer: CL; Product: Fresh oranges; Governance Structure: Contract; Asset Specificity: High (land preparation and use of specific implements, fertilizers, and systems); Transaction Uncertainty Level: Low (high level of knowledge of supply, demand, price, and cooperative statute); Transaction Frequency: High (regular supplies throughout the harvest); Opportunism (ex-ante and ex-post): Low; Bounded Rationality: Low-medium.	Main Supplier: Members; Product: Fresh oranges; Governance Structure: Contract; Asset Specificity: High (land preparation and use of specific implements, fertilizers, and systems); Transaction Uncertainty Level: Low (high level of knowledge of supply, demand, price, statute, and behavior of agents); Transaction Frequency: High (regular supplies throughout the harvest); Opportunism (ex-ante and ex-post): Low; Bounded Rationality: Low.

Source: Authors' own elaboration, based on Aguiar (2020) and Aguiar *et al.* (2021).

The frequency of the orange transactions from the members to the cooperative is classified as high, with regular supplies occurring throughout the harvest season (Aguiar, 2020; Aguiar *et al.*, 2021). The frequency of using market information (such as price, supply, and demand of oranges) and managerial information (costs, stock, and available technology) by the members for decision-making in negotiating the sale of oranges to the cooperative is classified as medium. This demonstrates a medium level of bounded rationality on the part of the members, indicating the inability of the agents to fully comprehend and process all necessary information for decision-making in negotiation situations, according to Arbage (2004) as cited by Aguiar (2020); Aguiar *et al.* (2021). The use of these same pieces of information by the cooperative for decision-making in negotiating the acquisition of oranges from the members is classified as high, indicating a low level of bounded rationality by the cooperative. Furthermore, the proximity between the cooperative and the market facilitates and accelerates access to information by the institution.

Overall, from the perspective of Aguiar (2020) and Aguiar *et al.* (2021), the characteristics of the orange transaction between the members and the cooperative consist of an asset with high specificity, low uncertainty, and high supply frequency. The characteristics of the agents (members and cooperative) are highlighted by a low level of opportunism and a medium-low level of bounded rationality, based on responses from both parties.

Given the above, the contract was chosen as the regulatory means of the economic transaction, characterizing the governance in its hybrid form. The contract includes items such as the required product specificity to meet export demand through Fairtrade, the purchase price of oranges by the cooperative, the supply frequency by the producer, and the producer's responsibility for transporting the goods to the processing industry.

The low degree of transaction uncertainty reflects the institutional preparedness by the cooperative and its dissemination to the cooperative members, as well as prior knowledge of behavioral attributes by the agents involved in the transaction. This positively correlates with the low opportunism and low ex-ante and ex-post risks of this economic relationship. In this sense, hybrid governance appears to effectively coordinate transactions,

minimizing opportunism in relationships and providing an efficient solution to the historical issue of commercial integration difficulties among citrus growers (Aguiar, 2020; Aguiar *et al.*, 2021).

In the relationship between the cooperative and the processing industry, the uncertainty surrounding this transaction can also be classified as low, as the vice-president of the entity states that the cooperative has a high level of knowledge about the institutional rules involved in the transaction and the behavior of the processing company in acquiring oranges.

From the cooperative's perspective, the processing industry does not exhibit self-interest behaviors such as distorting information about demand, price, and breaching contracts in purchasing oranges, classifying the level of opportunism in this relationship as low or nonexistent. The frequency of using market information (such as price, supply, and demand of oranges) and managerial information (such as costs, stock, and available technology) by the cooperative for decision-making in negotiating the sale of oranges to the processing industry is classified as high, indicating a low level of bounded rationality by the cooperative (Aguiar, 2020; Aguiar *et al.*, 2021).

Overall, and as initially highlighted in the member-cooperative relationship, the characteristics of the orange transaction between the cooperative and the processing industry involve an asset with a high investment degree, low uncertainty, and high supply frequency. The characteristics of the agents are highlighted by low levels of opportunism and bounded rationality, from the cooperative-buyer's perspective (Aguiar, 2020; Aguiar *et al.*, 2021).

THE CACAO AGRI-FOOD SYSTEM

Brazil has been making efforts to expand cacao production since the end of the 20th century, when the industry faced stagnation due to various reasons, including decreased productivity caused by phytosanitary problems,

particularly the fungal disease witches' broom (*Moniliophthora perniciosa*), conservatism within the agricultural production segment, among others. From 2016 to 2021, the growth rate of cacao cultivation in Brazil was 42%, reaching a production of 302,000 tons of beans in 2021 (FAO, 2023). This production growth has been accompanied by new institutional arrangements in the supply chains motivated by the increasing value placed on sustainability and origin aspects. In this context, certifications play a significant role. Examples of voluntary certifications used for sustainability in the sector include organic, Fairtrade, UTZ, and Rainforest Alliance. Brazil accounted for 1% of global organic production in 2020 (Presse, 2020). Organic certification ensures that products have indeed been produced within the standards of organic agriculture, primarily due to the absence of pesticides and chemical fertilizers, for example (Organicsnet, 2023).

CASE STUDY ON CACAO

The analysis focuses on the state of Bahia, specifically the southern region of Bahia, as it accounted for 83% of national production in 1990, with this production being 51% in 2020 (Brainer, 2021). This region and other organizations have been making efforts to implement higher-quality cacao production through support policies and the establishment of a geographical indication. These actions involve projects from processing companies and other organizations acquiring raw materials, as well as local governance.

The governance structures established in the producer-buyer relationship were evaluated, focusing on the economic, environmental, and social aspects of sustainability, based on contributions from Sachs (1993) and Elkington (2004, 2006). In the economic realm, analytical categories indicated by Transaction Cost Economics (TCE) were used, adapted from the works of Reys, Arbage, and Oliveira (2009, 2010) and Arbage (2004)⁷.

⁷ In the case study on cacao, the economic analysis can be comprehensively carried out from the perspective of the purchasing processing company towards the collective organization, although there was no triangulation of the information.

For environmental and social aspects, the concepts of sustainability and authors like Neumeier (2012) and Moulaert (2009) were considered.

The case of cacao production analyzed highlights the characteristics of organic certification, which includes quality attributes such as the absence of chemical inputs, sustainable cultivation methods, and environmental and social preservation. These attributes are not easily perceived through observation, hence the necessity for third-party verification. Certifications are thus employed to make this information clear to all agents involved in the production processes along the agribusiness system, including the consumer (Santini Pigatto *et al.*, 2020).

It can be observed that the demands of purchasing agents extend to contractual relationships, as they involve aspects related to organic product certification. The processing purchasing organization focuses on meeting both national and international markets with high-quality cacao beans that offer better performance in chocolate production and flavor. These quality attributes surpass the product standards established by the government through IN38/2008⁸ which sets standards for cacao beans. In the relationship between the producing agents and the collective organization, no formal contracts were identified. However, the relational value involved is very high due to factors such as the origin of the producers (many from the European Union, bringing with them 'values' of the land) and the nature of the production itself. The production is conducted in a cabruca system⁹, which motivates and gathers agents who value nature preservation (Box 3).

⁸ Normative instruction no. 38/2008 presents a classification of cocoa beans from type 1 to 3 and out of type, with tolerance percentages for defects such as mold, smoke, insect damage, slate, germination and flattening, from lowest to highest tolerance from type 1 to out of type (Brazil, 2008).

⁹ The cabruca system consists of a traditional cocoa agroecosystem that involves traditional knowledge, conservation and preservation of native species, promoting interaction with the ecosystem (Setenta; Lobão, 2012).

Box 3 – Characterization and governance structure in the cacao case study

Type	Producer Scope	Purchasing Company (ECP1) Scope
Characterization	Six producers; average age: 58 years Average experience in cacao production: 25.5 years. Educational background: majority with higher education or postgraduate degrees. Agricultural properties for cacao production: mostly owned, with most owning two to three properties Economic activities: diversified, including cacao, cupuaçu, açaí, peach palm, coffee, palm heart, cacao processing, and rural tourism services. Labor used: family labor (1-2 people); predominantly permanent labor (average of five people). Cacao production system: Organic cabruca. Average production (2013-2015): 845 arrobas. Certifications: Organic Brazil (since 2002), USDA organic (since 2003), and equivalent standards for European regulation (since 2002).	National family-owned company. Founded in 2005, with a prior history in chocolate production for final consumption. Economic activity: primary cacao processing. Crushing capacity: 20,000 tons per year. Product portfolio: Conventional line (80%) and special line (with certifications, 20%), for the years 2014-2015. Certifications: Organic Brazil, USDA organic, EU organic regulation, Kosher, Fairtrade, Rainforest, and Raw. Market: 50% for export and 50% for the domestic market, including cosmetic companies, chocolatiers, and dietary supplement companies.

Type	Producer Scope	Purchasing Company (ECP1) Scope
Commercialization and Governance	Purchasing Agents: Collective Organization (OC) and local market. Vertical Integration: One producer is also involved in chocolate manufacturing. – Transaction with OC: 50-65% of the average production (2013-2015). Product sold: cacao beans – Governance Structure: No formal contracts (high relational value). Payment: Immediate Premium: 30% above market price + a percentage of the net gains of the current year, proportional to the volume each producer delivers during the year. – Transaction OC to downstream (secondary information): Purchasing agents: national and international chocolate companies (including ECP1). Product sold: cacao beans.	Suppliers: Producers and cooperatives from the states of Bahia and Pará. Product Acquired: Organic cacao beans (20% of total production, certified) and conventional beans (80%) for the years 2014-2015. – ECP1 Transaction with OC: Acquires approximately 90% from OC. – Transaction Characteristics: Long-term transaction (11 years). Uncertainty: Low level, due to high information sharing in three areas (demand forecast, production forecast by OC, and production innovations by producer-OC). Asset Specificity: High (physical, locational, dedicated), Medium (temporal). – Agent Characteristics: Opportunism: Low level in both the ECP1-OC relationship and ECP1's view of the OC-ECP1 relationship. Limited Rationality (RL): Low RL, with extensive information on the quality cacao market (price, demand, supply); from suppliers regarding production technologies and quality; processing technologies; and management (costs, inventory, and marketing). – Governance Structure (with OC): Annual contract, detailing the volume purchased, payment terms, and price. Payment Method: Immediate. Transportation: Conducted by the company without discounting. Premium: 50% to 70% above market price; price benchmark based on downstream purchasing companies.

Source: Santini Pigatto *et al.* (2020).

The transaction between the collective organization (OC) and the purchasing agent (ECP) occurs with annual supply contracts. It is noticeable in this transaction an economic governance that translates not only into the existence of a contract but mainly into the efficiency and productive, informational, and economic coordination between ECP and its client, which leads to a valuation of the purchased product, given the on-site verification of preservation and work aspects in agricultural production. This valuation is both economic—higher premiums attributed to the marketed cacao beans—and related to the appreciation of the Atlantic Forest, given the production in the cabruca system. Another factor contributing to effective governance is the transaction and agent characteristics observed from the ECP perspective, indicating more effective governance, such as the long-term relationship (specifically 11 years), low uncertainty level, high asset specificity in physical, locational, and dedicated factors (only lower in the temporal factor due to the storage capacity of the beans), low opportunism level (in the ECP-OC relationship and the OC's view of the ECP), and low limited rationality, i.e., a higher level of information utilization regarding the market, supplier production and quality technologies, processing technologies, and managerial aspects (Santini Pigatto *et al.*, 2020).

Thus, more effective economic governance was observed at the agro-industrial system level between the ECP and its downstream purchasing agent, reflecting a valuation of the purchased product that involves both economic and non-economic aspects. The coordination and efficiency achieved—also supported by contractual governance—are evident in the relationship between the OC and the producers, given the net financial gains they obtain at the end of each year, proportionate to the volume each producer delivers throughout the year.

When analyzing whether this economic governance also impacts social and environmental aspects, it becomes clear that there is no direct influence or coordination by the purchasing agent in this regard, as the relationship is purely commercial. However, it is worth noting that the purchasing companies' willingness to pay a premium price for cocoa beans

can incentivize producers to maintain quality and adopt sustainable socio-environmental practices.

Regarding environmental factors, it is evident from the producers' perspectives that they aim to maintain or even expand forest preservation areas, including production (and replanting) using the cabruca system. In the case analyzed, all farms have protected springs that not only supply water to the families living on the property but also contribute to the preservation of regional rivers (Santini Pigatto *et al.*, 2020).

Therefore, the established governance structure fosters economic sustainability and operates based on producer and buyer incentives. The hybrid forms adopted closely resemble market structures where price acts as an incentive mechanism, such as paying premium prices for higher-quality cacao beans. However, there are other non-financial incentives indirectly affecting environmental and social sustainability, such as technical assistance, donation of seedlings, and organic inputs to producers to improve the production process. Another point to highlight is the certifications that bring a series of social and environmental requirements.

Regarding social aspects, even though there are established programs by the buyers, no significant changes in social relations or satisfaction levels of families or communities were noted (Santini Pigatto *et al.*, 2020).

FINAL CONSIDERATIONS

The cases analyzed in this chapter highlight relevant production systems for the country from economic, social, environmental, historical, and cultural perspectives, both for orange and cacao. These systems have been receiving added value and coordination promotion through certifications that signal information from agricultural production to the destination. Hybrid governance forms were observed in both cases in various transactions between system agents, specifically contracts, as higher quality attributes are crucial for both systems.

Regarding sustainability aspects, greater economic convergence was noted through premium prices. However, the cooperative format in the case of orange production and sale and coordination exercised by a secondary buyer (in prices) in the cacao case denotes important social aspects for better information exchange and reputation in the systems.

It is worth noting that the certifications used in both systems encompass requirements beyond technical aspects, also covering social and environmental aspects. Thus, the governance established in the cacao and orange production systems promotes primarily economic sustainability but also indirectly contributes to social and environmental sustainability.

In broad terms, the results contribute to the UN's SDG 12, specifically to achieving sustainable management and efficient use of natural resources and encouraging companies to adopt sustainable practices and integrate sustainability information into their reports (SDGs 12.2 and 12.6, respectively).

As a contribution of this chapter, it is hoped that the analyzed cases can inspire new analyses of coordination and governance in Brazilian agri-food systems, both complex ones.

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