

**A FRAMEWORK FOR ANALYZING COORDINATION
IN AGRICULTURAL VALUE CHAINS:
EVIDENCE FROM CEREAL MARKETS IN MALI**

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ABSTRACT

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Firms, farmers, and development actors view improved value chain governance as part of the solution for coordinating the actions of African farmers with the demands of emerging market segments. An important diversity of vertical coordination governance structures (such as contracting arrangements) and horizontal coordination governance structures (such as farmer organizations) are possible for linking farmers with such segments. The objective of this thesis is to better understand these governance structures and the conditions under which each is most cost-effective for achieving coordination. Building on the transaction cost economics literature, a framework that represents buyers' and farmers' governance structure choice is first developed. The framework is then empirically tested using a unique dataset from fifteen rice, maize, and millet/sorghum value chain case studies from Mali. Results show that marketing contracts and marketing cooperatives is the dominant governance structure pair used to coordinate farmers with higher-revenue segments in these cases. Transaction cost characteristics do influence buyers' and farmers' governance structure choice; additionally, time, social incentives, and the presence of other transaction cost-reducing governance structures may also be significant.

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I dedicate this research,
and the winding path of experiences that has led me here,
to my parents Adrian and Karen,
for teaching me Hope and Rootedness,
in this and in all things.
I love you.

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KEY TO ABBREVIATIONS

AV	Village association in Mali (in HC structure terms, refers to the bargaining association)
BNDA	National Agricultural Development Bank of Mali (<i>Banque Nationale de Développement Agricole</i>)
CMDT	Malian Textile Company (<i>Compagnie malienne pour le développement du textile</i>)
Coop	Village-level cooperative in Mali (in HC structure terms, can refer to either a bargaining association or marketing cooperative structure)
ECOWAS	Economic Community of West African States
FO	Farmer organization
ha	Hectare(s)
HC	Horizontal coordination
M	Maize (referring to maize case studies)
MFO	Micro-financing organization
MG	Malian government
M/S	Millet/sorghum (referring to millet/sorghum case studies)
MT	Metric tons
NGO	Non-government organization
NGC	New generation cooperative
ON	Niger Office (<i>Office du Niger</i>)
OPAM	Malian Office of Agricultural Products (<i>Office des produits agricoles du Mali</i>)
R	Rice (referring to rice case studies)
TC	Transaction costs
TCE	Transaction cost economics

UEMOA	West African Economic and Monetary Union
USAID	U.S. Agency for International Development
VAT	Value-added tax
VC	Vertical coordination
WFP	World Food Program

1. INTRODUCTION

Since the 1990s, agro-food systems around the world have experienced major transformations, including increases in consolidation, specialization and differentiation, globalization in sourcing and marketing, and use of private standards (Reardon, et al., 2009). The resulting expansion and emergence of markets offers an opportunity for developing-country farmers to strengthen and broaden their commercial marketing options, including access to higher-revenue segments (Weatherspoon and Reardon, 2003). However, firms in these markets seek suppliers that can coordinate their product characteristics and marketing activities to meet high quality, volume, and timing requirements (Poulton and Lyne, 2009; Weatherspoon and Reardon, 2003).

Smallholder farmers in developing agricultural sectors often face unique challenges in fulfilling complex demands in a cost-competitive manner. Farm-level constraints include limited access to fertile land and non-land productive assets (such as irrigation and farm equipment), to production and marketing technologies (such as certified seeds, fertilizer, and storage facilities), and to commercial farming knowledge and experience (Barrett et al., 2011; Reardon, et al., 2009; Barrett, 2008). Other market-related constraints include limited or no access to insurance, credit, and input markets and to extension networks (Reardon, et al., 2009). Farmers' remote locations, the poor state of rural roads, low agro-ecological suitability (as related, for example, to water availability and soil), and weak commercial infrastructure (Barrett et al., 2011; Barrett, 2008) are other constraints faced by smallholder farmers. These challenges have been found to be particularly important in the African agricultural context (e.g., Poulton and Lyne, 2009;

Fafchamps, 2004). Consequently, buyers sourcing raw agricultural commodities may pass over African smallholder farmers for more endowed, experienced, and accessible suppliers.

The negative impacts of these problems on farmers, and in some cases the problems themselves, can potentially be redressed through improved market coordination between farmers and other value chain actors. A common strategy for improving market coordination is the use of buyer-supplier governance structures, such as contracting and longer term partnerships (Prowse, 2012; Reardon, et al., 2009). Governments and development actors also increasingly consider the use of these vertical structures as tools to reduce poverty and stimulate agricultural growth (Jia and Bijman, 2014). For some time, value chain, government, and development actors have also considered vertical and horizontal governance structures, such as farmer organizations (FO), as another crucial element in improving market coordination (Markelova, et al., 2014). However, the frequent failure of both vertical and horizontal governance structures in different countries and value chains underlines the difficulty in selecting governance structures that are appropriate to a given case (Prowse, 2012).

The objective of this thesis is to better understand vertical and horizontal governance structures, and the transaction characteristics under which each is most cost-effective for achieving coordination. Specifically, it develops a coordination framework that models buyers' vertical governance structure choice and farmers' horizontal governance structure choice, based on transaction cost-related characteristics.

The research primarily builds on Williamson (1981) and Peterson et al. (2001), which specified a continuum of vertical governance structures from which a buyer may choose to coordinate a transaction; on Williamson (1981)'s description of the transaction characteristic determinants of this choice; and on Sartorius and Kirsten (2007; 2005), which operationalized

the transaction cost conceptual framework for a developing country context. In particular, this thesis seeks to enhance Sartorius and Kirsten (2007; 2005)'s framework by introducing resource-providing contracts as another type of vertical governance structure (Mighell and Jones, 1963), and by incorporating externality problems (Williamson, 1981) as an additional determinant of transaction costs and governance structure choice. For the horizontal dimension, this research draws primarily on Staatz (1987a)'s transaction cost analysis of farmer collective action and Chaddad (2012)'s typology of farmer organization structures.

The hypotheses represented in the framework are then tested using a unique dataset from fifteen rice, maize, and millet/sorghum¹ value chain case studies from Mali. Cereal value chains play an important role in agricultural livelihoods and food security in Mali and include a wide variety of governance structures. A case-study methodology is employed because of its suitability to developing country agribusiness research contexts, and because of its potential to facilitate theory development.

This thesis is organized as follows. Chapter 2 describes and draws on the transaction cost economics literature to develop the conceptual framework. Chapter 3 describes the case study methodology and data that are used to empirically test the hypotheses. Chapters 4 through 6 analyze the market segments, transaction characteristics, and governance structures observed from the Mali case study data. Chapter 7 discusses the results, and Chapter 8 concludes by discussing the implications for policy and agribusiness strategy, and future research.

¹Although millet and sorghum are two different crops, this paper will generally analyze them as representative of a single value chain, given their similar physical characteristics and substitutability in Malian value chains. However,

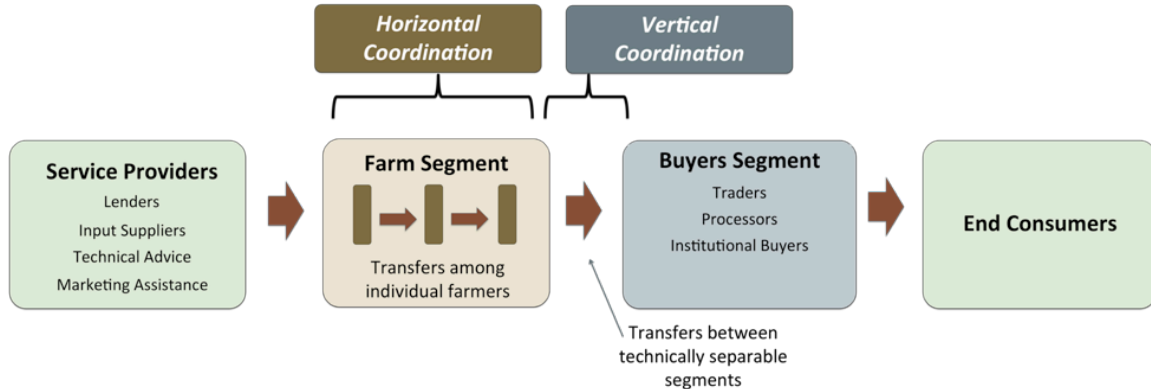
2. CONCEPTUAL FRAMEWORK

2.1. Economic coordination and the transaction cost economics approach

Economic coordination is defined as the measures designed to make actors within a marketing system “act in a common or complementary way or toward a common goal” (Poulton, et al., 2004, 521). It can be conceptualized as having two key dimensions, where each dimension refers to a set of relationships within the value chain that must be coordinated in order for the entire system to work efficiently. The first dimension refers to vertical coordination (VC) between trading partners at technically separable segments of the value chain. Consistent with the general definition of economic coordination, Peterson, et al, (2001, p. 150) defined vertical coordination as the process of aligning and controlling price and other incentives, quantity, quality, and the terms of exchange across segments of a production or marketing system. The second dimension of coordination refers to horizontal coordination (HC), which is defined as the process of alignment and control among actors within a *single* segment of the value chain, such as between farmers.² Although horizontal coordination structures have distinctive associational characteristics, they also commonly feature a clear forward and/or backward “thrust” that helps them to achieve vertical coordination as well. This is further discussed later in this chapter. Figure one is a schematic of the commodity transfers (represented by red arrows) that take place within and between technical segments of an agricultural value chain (represented by the light-colored boxes), and visualizes horizontal and vertical coordination with respect to this process.

² Given the particular relevance of farmer-level challenges to questions of farmer market access, this paper focuses on transaction cost problems faced by farmers, and on coordination structures available to farmers to address these.

Figure 1: Horizontal and vertical coordination within an agricultural value chain



In the neoclassical perfect-competition paradigm, price is assumed to be the primary coordinating mechanism: prices efficiently provide incentives, allocate risks, and carry essential information on quality, quantity, and timing so that economic actors can focus on competing, instead of actively coordinating their actions (da Silva and Rankin, 2014).

However, African agricultural market contexts rarely come close to meeting these conditions, and thus actors must rely on other coordination strategies in addition to the price mechanism (Poulton and Lyne, 2009). What types of coordination strategies exist? And how can economic actors know which ones work best for different transaction situations?

Transaction cost economics (TCE) is an important stream of the coordination literature that seeks to answer these questions. Its premise is that there is always some cost in using the price mechanism to coordinate economic activities in imperfect markets³ (Coase, 1937).

Transaction costs (TC) themselves are constituted by (1) the risk of losses when unplanned contingencies (or disturbances) arrive in an exchange, plus (2) the coordination costs of

³ A transaction is the basic unit of analysis in TCE, and occurs when a good or service is transferred across a technologically separable segment in a value chain. One stage of production, processing, or assembly activity terminates, and another begins (Williamson, 1981). This research expands the concept of a transaction to include transfers among actors at a single segment of a value chain.

attempting to reduce such risks (Dorward, 1999; Grover and Malhotra, 2003). Transaction costs fall into either *ex ante* or *ex post* categories, which refer to whether costs are incurred before or after the establishment of the contract, respectively.⁴

TCE posits that firms and inter-firm contracts are governance structures that emerge as a result of transactions costs, in an effort to minimize costs through the establishment of rules by which exchanges are to be administered (Coase, 1937). Each governance structure represents a unique tradeoff between its transaction cost-reducing competencies, and internal (governance) costs. Therefore, different governance structures dominate in varying TC situations. It follows that the primary task of TCE is, first, to identify and describe the key factors that determine the magnitude of transactions for different situations. The second task is to specify the different governance structures that are available to manage these costs. Thirdly, TCE discriminately matches each transaction situation to the most cost-economizing governance structure (Williamson, 1981; 2000). This approach, along with the TCE theory that links these steps, offers a very useful tool for studying economic coordination questions.

Following this approach, this chapter develops a two-part conceptual framework that describes the vertical and horizontal dimensions of economic coordination that are important to link farmers and commodity buyers efficiently in agricultural value chains. TCE's theory of coordination has been most operationalized with respect to the vertical dimension, which the literature commonly represents as the governance structure choice from the perspective of an agribusiness buyer (e.g. trader, processor, retailer, or exporter) wishing to procure raw

⁴ Ex ante transaction costs are largely fixed and information-related, and include the costs of making contracts: screening, negotiating exchange terms, and measuring and transferring property rights (Williamson, 1981; North, 1990). Ex post transaction costs include contract monitoring and enforcement, negotiating solutions to problems when disturbances arise, and switching costs and other losses in the event that a contract fails. Ex post transaction costs such as monitoring and loss-related costs can be variable costs, and thus increase as traded volumes increase (Williamson, 1981; North, 1990; Poulton and Lyne, 2009).

commodities directly from suppliers (Sartorius and Kirsten, 2005; Peterson, et al., 2001; Barrett, et al., 2012). The framework developed in this paper also adopts this assumption for the VC dimension. For such a firm, the goal of the VC governance choice is to maximize the capacity of specific assets by procuring a stable supply requisite supply of homogenous, high quality products, while minimizing costs (Bijman, 2008).⁵ The horizontal dimension of the coordination framework represents the HC governance structure choice, as made by farmers wishing to market raw commodities to a buyer. As this chapter will show, farmers also have latitude to initiate their own governance structures in order to address coordination problems. These HC structures combine associational strategies with some form of vertical integration in order to maximize the welfare of their farmer members.⁶

2.2. Transaction characteristics important to coordination

Most applications of TCE focus on three transaction characteristics, 1) asset specificity, 2) frequency, and 3) uncertainty, which interact with one another to determine the level of transaction costs and governance structures in different situations. Williamson (1981) furthermore argued that the presence of externalities in a transaction is another important

⁵ However, the assumption that firms initiate and lead the strategy process does not necessarily preclude the participation of farmers in this process because farmer must ultimately choose whether to accept an exchange offer from a buyer. Barrett, et al. (2001) explained that this is based on the farmer's subjective perception regarding his/her expected welfare level from participation versus his/her expected welfare from not participating. Practically, especially when the information-gathering and negotiation costs involved in developing a contract or partnership are extensive, a firm may engage potential farmer suppliers early on in this process.

⁶ In developing countries, farmers usually only self-organize on a formal basis when they are assisted by external partners. Commonly, public agencies or Non-Government Organizations (NGOs) catalyze collective farmer action with material and technical support (Markelova, et al., 2008). Downstream buyer firms may be involved in this process, or may themselves be the primary catalyzer. However, FO success ultimately depends on farmers' ownership and control of the collective action process and of the resulting institution (Markelova, et al., 2008). Therefore, the assumption that the HC choice is primarily a farmer choice is appropriate.

characteristic. The below discussion provides a brief definition of each concept, and some examples for a transaction between farmers and an agribusiness firm.

Asset specificity refers to the extent to which an investment has limited value outside the exchange relationship (Poulton and Lyne, 2009). A firm making investments in specific assets, such as in processing equipment or market brand that depend on a particular quality of input, will seek increased control over the supply exchange relationship, including certain commitments and possibly continuity from their trading partner, in order to minimize holdup or side-selling (Williamson, 1981). Individual farmers may also invest in specific assets, such as specialty input combinations or delayed-return cash crops. In these situations, farmers may associate to collectively increase bargaining power or vertically integrate forwards or backwards to reduce the risk of buyer hold-up (Statz, 1987a).⁷

Frequency of transactions can multiply contract setup costs, and may also increase the chances for opportunistic behavior (Poulton and Lyne 2009; Williamson, 1989). Commodity perishability, limited transportation and warehousing, and processing or marketing complexity are some reasons for a high transaction frequency between firms and a supplier, which motivate the establishment of longer term contracts in order to reduce the costs and risks incurred with repeated contracting. There is also a scale dimension of the frequency principle that is crucial: a buyer must sometimes transact across many diffused small-scale farmers in order to procure sufficient throughput for his own value-added activities (Jia and Bisman, 2014). In such cases of asymmetrical scale, farmers may organize in order to compete for bulk markets.

⁷ Statz (1987a) noted that farmer-stakeholders of a cooperative should have less incentive to act opportunistically toward their FO than towards a separate firm. He also stated that when opportunistic behavior risks *on the part of farmers* prevent buyer firms from undertaking otherwise profitable agribusiness activities, farmers may associate and integrate forward to fill such an empty niche.

Uncertainty refers to unanticipated changes in the circumstances and behavior surrounding a transaction. Aside from increasing information, contracting and ex post monitoring costs, uncertainty is the source of contractual disturbances to which costly adaptation may be required of two contracting parties (Williamson, 2008; Grover and Malhotra, 2003). Uncertainty can be with respect to weather, farm production, commodity price and availability, market demand, policies affecting supply and demand, and contract enforcement (Bijman, 2008; Sartorius and Kirsten, 2005; Grover and Malhotra, 2003; Young and Hobbs, 2002). As these uncertainties increase, TCE hypothesizes that economic actors will respond by adopting coordination mechanisms that offer increased control over unknowns. For example, bargaining associations may appoint or hire agents to obtain information about marketing options and marketing cooperatives may employ contingency pricing to increase the flexibility in the timing of sales (Staatz, 1987a).

Externalities occur when one party's actions positively or negatively affect the income flows of another's (Kim and Mahoney, 2005). Williamson (1981) argued that negative externalities are a manifestation of measurement problems accounted for by TCE. However, while information-related costs of measuring property rights is essential to addressing negative externalities, this problem can also occur when property rights are already defined, but *inefficiently* so, or if they are well-defined but appropriated by another party (Kim and Mahoney, 2005). Thus, the externality principle can arguably constitute an important transaction cost determinant that is related to, but distinct from the other transaction attributes. One common negative externality in agricultural marketing is intentional or unintentional quality debasement that affects another actor's productivity and profitability (Williamson, 1981). An example is when farmers degrade the quality of their output and thus affect the buyer, or when farmers themselves purchase

debased farm inputs with characteristics that are difficult to determine ex ante. Alternatively, a commodity handler or processors can degrade the quality of farmers' produce, and thus depress farm-level demand and price (Staatz, 1987a). In general, the externality principle drives an actor to increase control over transactions, and in the most extreme cases to integrate vertically into adjacent market stages (Staatz, 1987a). Staatz (1987a) argued that farmer cooperatives have potential advantages over firms in supervising quality control processes, in addition to disposing of more effective means of sanctioning members who do not comply.⁸

Many goods and services that are essential to agricultural production and commerce, such as market roads or basic research and technical extension, are commonly not provided in African contexts because of their public good nature. Firms and farmers might respond to such situations, in which the state is not providing essential *positive* externalities, by providing the missing good themselves. Where farmers expect their trading partners to generate a positive externality, they may form a cooperative FO to force the firm, through competition, to improve the service to farmers.⁹

While the TCE literature generally emphasizes the significance of transaction characteristic determinants in driving firm vertical coordination decisions, this thesis argues that they also influence farmers' decision to coordinate horizontally. This effect may be direct, as when farmers associate to redress opportunism or market power, reduce production or marketing uncertainty, or to access or provide services and products from thin markets. Farmer collective action may also be motivated by opportunities to reduce transaction costs faced particularly by buyers, when it is within farmer cooperatives' comparative advantage to redress such costs and when it provides farmers with a competitive advantage vis-a-vis other competing suppliers. Such

⁸ However, sometimes there are also social pressures within FOs to not enforce the quality control rules.

⁹ This motivated many of the "competitive yardstick" activities of early American cooperatives (Staatz 1987a).

advantages include quality control and other supervision, aggregation (increased scale), and general contract monitoring and enforcement. A firm may also benefit from the mutual asset specificity resulting from FOs making large lumpy investments in specific assets, which can reduce side-selling by farmers, raise exit costs for farmers, and thus improve the stability of an exchange relationship (Sartorius and Kirsten, 2007). Additionally, by interfacing between individual farmers and a firm, a FO may also help to foster good vertical relations and trust between parties, which may further promote stability and contract compliance (Sartorius and Kirsten, 2007; Bijman, 2008). Table one summarizes the types of transaction characteristics and related issues that are relevant to farmers and buyers in an exchange relationship.

Table 1: Transaction characteristics and related problems common to buyers and farmers

Transaction Characteristic	Types	Common Related Issues (Relevant to both farmers and buyers)
1. Asset Specificity	With regards to: (a) site; (b) physical; (c) human; (d) time; and (e) brand	<ul style="list-style-type: none"> • Dependence on specific input requirements • Availability of substitutes • Hold-ups, side-selling, other problems of opportunism
2. Uncertainty	Circumstantial and human uncertainty with regards to: (a) price and availability of supply; (b) production processes; and (c) respect and enforcement of contracts	<ul style="list-style-type: none"> • Production shocks such as weather (e.g. droughts, floods), equipment failure, crime • Incorporates costs related to information, contract-making, and monitoring of behavior
3. Frequency	Transaction frequency with (a) the same supplier in a given period; and (b) across multiple suppliers	<ul style="list-style-type: none"> • Perishable commodities • Buyer's limited transport and storage • Other timing difficulties due to production, processing, or marketing complexity
4. Externalities	Presence of negative upstream or downstream externalities due Missing positive externalities which are otherwise expected to be provided by the state or a firm	<ul style="list-style-type: none"> • Quality debasement during production and post-harvest processes, transport and handling, or processing • Poorly defined or appropriated property rights • Weak grades and standards • Weak commercial infrastructure such as the poor state of rural roads, or the non-existence of utilities and cell phone networks

2.3. Value chain coordination governance structures

2.3.1. Vertical coordination structures

TCE posits that as transaction costs vary in different exchange situations, a continuum of governance structures emerges in order to cost-effectively coordinate economic activities across segments in the different situations. Drawing from Williamson's approach, Peterson, et al. (2001), specified a vertical coordination (VC) continuum consisting of five distinct governance structures: 1) spot markets, 2) specification contracting, 3) relationship-based alliances, 4) equity-based alliances, and 5) full vertical integration. Peterson, et al. (2001, p.152, italics added) argued that the latent variable creating this continuum is an increasing "*intensity of control* that the alternative strategies employ to assure that proper coordination occurs, i.e. coordination with minimum potential for error." Moreover, the very *nature of control* and *focus of control* also fundamentally shifts as one moves from left to right, from primary dependence on ex ante mechanisms to ex post mechanisms (Peterson, et al., 2001).

Spot markets are impersonal and are coordinated exclusively by the price mechanism and without conscious or deliberate coordination by the exchanging parties.¹⁰ In this governance structure, farm production and marketing is "open," with markets secured *after* production has been completed (Mighell and Jones, 1963). For buyers, spot markets represent a pure replenishment strategy (Jones, et al., 2007). Thus, all dimensions of spot market transactions are usually simultaneous. More so than any other coordination structure, spot markets provide "high-powered" incentives for economic actors to produce efficiently and to adapt to changing market conditions," and furthermore entail low governance costs (Chaddad, 2012, 451). However, as the

¹⁰ Although the trade may be assisted by general conventions such as public or private industry grades and standards, commodity exchanges, or auctions (Poulton and Lyne, 2009; Young and Hobbs, 2002, cited by Prowse, 2012)

vector of asset specificity, uncertainty, frequency, and externalities increase within a market system, actors face increasing coordination difficulties and risk in exchange, and will therefore seek more control over their transactions.

Specification Contracting, the next structure on the VC continuum, consists of advance agreements that stipulate in detail the conditions of trade. These contracts may be written or verbal, and include what is expected of each party, the rewards for compliance and sanctions for non-compliance, and the terms under which the contract continues or ceases (Poulton and Lyne, 2009). In contrast to a spot market, farm production is now undertaken for a *particular* market, and “the relationship between the contracting firms during the time the production processes are going on seems closer than in open production, because significant market commitments are known for at least one production period” (Mighell and Jones, 1963, p. 11).

Mighell and Jones (1963) differentiated between three types of specification contracting in a typology that is heavily referenced in the contract farming literature: 1) market-specification contracts, 2) production-management contracts, and 3) resource-providing contracts (henceforth referred to as marketing, production, and resource contracts, respectively). In marketing contracts, the buyer essentially stipulates the market specifications of the commodity to be transacted, but production decisions are left to the farmer. Production contracting allows the buyer to assert some control over the actual production process, usually through cultural or resource specifications and possible field inspections. In resource contracts, the buyer not only furnishes a market and participates in production management but also provides important inputs. Minot (1986) distinguished these contract types in terms of risk. Marketing contracts reduce risks related to the buyers’ supply market (or the farmers’ output market). Production and resource contracts, especially when combined, reduce risks related to quality, timing, and quantity;

especially when farm credits are difficult to access (Minot, 1986). Mighell and Jones (1986)'s typology provides useful nuance to the specification contracting category, and is thus incorporated into the vertical dimension of the coordination framework.¹¹

Relationship and Equity-Based Alliances are the next two governance structures on the VC continuum (Peterson, et al., 2001). Although these may use repeated contracting as a tool to further their alliance goals, three salient traits distinguish alliances from specification contracting. First, alliances are long-term partnerships between exchange partners, characterized by commitment and continuity that is concretized by some type of soft or hard equity.¹² Second, alliances are shaped by mutuality of objectives, control, risk, and benefits. Third, while alliance parties exercise some ex ante control in the creation of the partnership structure, they rely primarily on internal, ex post control mechanisms to actually coordinate exchange and resolve any contingencies and differences.

However, there are also important differences between these two types of alliances. For relationship alliances, the focus of control is the informal relationship itself, the terms of which may be written but not usually contractually enforceable. While relationship alliances usually require a considerable amount of “sweat equity” (time and energy, in addition to considerable exchange of information) to create and maintain the partnership, both parties can walk away from the alliance relatively easily if the benefits do not materialize as envisioned. In contrast, an equity alliance creates a “formal organization that has an identity distinct from the exchange

¹¹ To keep the typology within manageable limits, production-management and resource-providing contracts are combined into a single category. This assumption is supported by the observation that technical extension is itself an important farm input, and by the observation that in African contexts special farm production specifications will often also require the provision of material resources by the buyer or other partner.

¹² This is Williamson's concept of “bonding costs:” for example, when the burden of an asset specific investment falls on party A, it may require such bonding costs from party B, such as trading commitments of significant periods, price assurances during this period, the building up of reputation for trustworthiness, or other financial or time investments in party A and B's partnership (Williamson, 1985).

actors and that is designed to be their joint agent in the conduct of the coordination transaction” (Peterson, et al.; 2001, p. 154). Furthermore, parties make a significant equity commitment: financial and/or material, in addition to the time invested to create the alliance. In practice, a relationship alliance could consist of a strategic alliance between farmers and a buyer, characterized by a pattern of recurring specification contracts with preferential terms and information exchange within a broader partnership framework. Several authors (e.g. Peterson, et al., 2001; Vermeulen and Cotula, 2010) have identified farmer cooperatives, the subject of the next section, as a type of alliance.

Vertical Integration is pursued by a firm when the asset-specificity of its investments, combined with other transaction characteristic factors, becomes too great for a contractual relationship to provide sufficient security. Internal governance and full control becomes the governing process, which internalizes negative externalities and ensures against opportunistic behavior. However, there is a trade-off in terms of the dilution of market-powered incentives of employees, and in terms of higher internal costs (Poulton and Lyne, 2009). Vertical integration could result from a merger between two parties, an acquisition of one by the other, or one party’s divestment of resources to the other such that the latter completely takes over a particular function (Peterson, et al., 2001). It could also consist of a firm’s unilateral start-up of production activities that did not before exist.

Figure two is a visual tool that summarizes the elements of vertical coordination, and conveys the coordination framework’s first hypothesis: *All other factors held constant, as the vector of asset specificity, uncertainty, transaction frequency, and externality problems increase from very low to very high for a buyer in a commodity transaction (in grey), he or she will impose increasing control over the transaction through the use of different vertical coordination*

governance structures (in blue). The application of this tool is more fully described at the end of this chapter.

Figure 2: The vertical dimension of the coordination framework

	Spot Markets	Specification Contracting		Alliances		Vertical Integration
		Marketing	Resource	Relationship	Equity	
<i>Intensity & Mechanisms of Control:</i>	<i>Price</i>	<i>Planning & Specification</i>		<i>Relationship</i>	<i>Equity</i>	<i>Hierarchy</i>
Asset Specificity	Very Low (1)	Low (2)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Frequency	Very Low (1)	Low (2)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Uncertainty	Very Low (1)	Low (2)	Intermediate (3)	High (4)	High-Very High (4-5)	Very High (5)
Externalities	Very Low (1)	Low (2)	Intermediate (3)	High (4)	High-Very High (4-5)	Very High (5)

Adapted from: Sartorius & Kirsten (2007, 2005); Peterson, Wysocki, and Harsh (2001); Williamson (1981); Mighell & Jones (1963).

2.3.2. Horizontal coordination structures

Many authors have argued that farmer organizations¹³ commonly play an important role in linking smallholder farmers to non-traditional markets, and that governance structure influences FO performance (e.g., Barrett, et al., 2011; Poulton and Lyne 2009; Markelova, et al., 2009).

However, Chaddad (2012, p. 447) observed that a consensus has not yet developed as to how to

¹³ For the purposes of this paper, a farmer organization refers to a form of farmer cooperative, which can generally be defined as a business with three primary characteristics: 1) the primary stockholders are farmers, and are the major users of the organization's services; 2) stockholder benefits are tied to patronage; and, 3) formal governance by stockholders is structured democratically (Statz, 1987b).

define and typify the cooperative structure “in the continuum of generic forms of economic organizations.”¹⁴ Authors writing from a TCE perspective have sought to advance this debate by analyzing farmer cooperatives as a “hybrid” on the vertical coordination continuum, in that these structures blend market-like mechanisms (e.g., separated ownership and high-powered incentives) with hierarchy-like instruments (e.g., administrative controls, authority and common staff in a central structure), “while at the same time displaying some unique attributes such as democratic governance” (Chaddad, 2012, p. 447; see also Iliopoulos, 2003; Menard, 2007).

Based on this identification of cooperatives as hybrid, Chaddad (2012) proposed a continuum of farmer organizations that resembles Peterson, et al. (2001)’s vertical coordination continuum, with “market” (autonomous farmer) on one end, “hierarchy” (full horizontal integration of farmers) on the other end. Recall that Peterson, et al. (2001) identified intensity of control as the latent variable creating the coordination continuum and, furthermore, that alliance structures such as farmer cooperatives depend on the control mechanism of shared equity for coordinating member activities.¹⁵ Within the alliance category, the form and magnitude of shared equity varies, ranging from primarily soft equity (social capital, time, energy, information) in relationship-based alliances to harder forms (joint lumpy investments) in equity-based alliances. The HC continuum developed in this chapter thus extends Chaddad (2012)’s typology, by distinguishing farmer governance structures primarily in terms of the nature and level of

¹⁴ Over the last fifty years, different perspectives have argued for the conceptualization of farmer organizations as vertical integration of an association of farmers, as a single firm, as a coalition of firms, or as a nexus of contracts. For a review of these approaches, see: Cook, et. al., 2004; and Staatz, 1989.

¹⁵ Peterson, et al. (2001) conceptualize hybrids as “alliances,” specifically a form of equity based alliance (or joint venture). However, in many of the simple farmer cooperative forms found in Africa—especially those which are local and resource-poor—relationship-based dependencies still play a formative role in farmer organizational structures, in some cases even more so that shared equity.

pooling¹⁶ that is required. Pooling of resources refers to the alignment and deployment of individually owned assets, as well as to the equity requirements of members to make joint investments and fund operations (Jia and Bisman, 2014; Menard, 2004).¹⁷

Locating farmer cooperatives within the VC continuum prompts an obvious question: why not simply analyze these governance structures as one of the VC structures? There are two reasons for which this thesis develops a separate HC continuum. First, farmer organizations feature unique associational characteristics that distinguish them from pure VC structures, and which would not be captured by simply situating them within the VC continuum. Namely, governance in farmer organizations is usually based on democratic principles, or at least is tied to patronage (as in the case of New Generation Cooperatives, which are discussed below). Second, because farmers usually make the farmer organization choice, and because it can be separate from the VC choice (that is usually made by buyers), it is useful to describe this choice using a different continuum and terminology. Notwithstanding these distinctions, it is essential to understand the attributes that farmer organizations share with other VC structures.

Individual farmers, in the most basic mode of horizontal coordination, plan, plant, and sell without any personal, conscious, or deliberate coordination with other farmers. However, in a manner analogous to spot markets, the price mechanism nonetheless achieves a degree of coordination between farmers through supply and demand signals. This category also refers to horizontal coordination that is assisted by rules, standards, and services provided by value chain

¹⁶ In this thesis, use of the term “pooling” does not refer to pooling of outputs for sale. There is a whole literature on “cooperative pooling” that refers to how marketing cooperatives establish pools for various types of outputs they sell and how the pooling rules affect the distribution of benefits within the cooperative. This distinction will become important below when you refer to pooling with respect to bargaining coops.

¹⁷ Use of the term “pooling” here does not refer to pooling of outputs for sale. This notion of shared equity and pooling is consistent with what Chaddad (2012, p. 451) identifies as “ownership,” which refers to the increasing level of member investments and stronger property rights as one moves through the cooperative forms from left to right..

partners (such as a buyer firm), the state, other third party institutions such as non-government organizations (NGOs), or social convention.

Bargaining associations are a relatively simple horizontal structure in which farmers collectively bargain for better terms with a first-handler, other buyer, or input provider (Chaddad, 2012; Staatz, 1987a; Cook, 1993). A bargaining association may improve the competitiveness of its members by reducing contract-negotiation costs and providing information about output aggregation. They can also reduce uncertainty for their members by allowing farmers to practice contingency pricing or set up social net mechanisms (Staatz, 1987a).¹⁸ However, minimal levels of pooling characterize the structure of a bargaining association. Moreover, ownership is almost completely separated, in that farmers' output does not at any point become property of the association and no major collective assets are owned by the cooperative (Chaddad, 2012). Control is also minimal: typically, a weak volunteer-based executive leadership exists to share information and bargain for the cooperative, and is supervised by a democratically elected board of directors (Chaddad, 2012). Farmers may formalize the open-membership association with statutes and bylaws, and annually make individual agreements committing certain volumes to the group bargaining effort, under collectively negotiated terms (Chaddad, 2012).¹⁹

Marketing cooperatives refer to the integration of farmers into adjacent markets in order to more aggressively address transaction cost problems. These organizations seek to increase margins and counterbalance market power primarily through value addition and direct competition, as the cooperative is now involved in sorting, storing, transporting, and/or

¹⁸ Although these activities may be restricted due to the association's limited size and scope, and by limited patronage funds and warehousing space (individual or collective) (Staatz, 1987a).

¹⁹ The internal vertical coordination that takes place within bargaining association may be seen as a loose analogue to specification contracting (but within a larger horizontal governance framework), and thus the focus of control is planning and contract-specification (Chaddad, 2012). Marketing cooperatives also make internal transactions analogous to marketing contracts, in addition to the possible use of resource contracts with their members.

processing (Chaddad, 2012). In addition to redressing opportunism and market power, backwards and/or forward integration can also allow marketing cooperatives to help fill missing or abandoned markets, internalize negative externalities, provide public good-type services, or encourage generation of positive externalities (Staatz, 1987a). Marketing cooperatives' increased size, administration, and control (over their members) may also allow them to meet stringent buyer requirements more effectively and to reduce market uncertainty for their farmers (Poulton and Lyne, 2009; Staatz, 1987a).

In comparison to bargaining associations, marketing cooperatives require a medium amount of equity from their members in order to finance the additional joint investments and operations needed to sustain activities. Ownership is thus mixed: while farmers continue to own individual farm assets, the cooperative usually takes ownership of the marketed commodities and owns more assets. In addition to member dues, capital may be mobilized from internally generated risk capital, retained profits, external loans and equity, and/or grants from various sources. Marketing cooperatives also exercise a medium level of centralized control over how assets are deployed and interrelated member activities. Members hire and supervise (through a board) an executive staff to run the business and to “coordinate activities in the central office, but also to coordinate interdependencies among members and between members and the cooperative” (Chaddad, 2012, 455). As with a bargaining association, farmers formalize a marketing cooperative with a horizontal agreement (statutes and bylaws), but use spot purchases or contracts with the farmer members to manage the vertical interdependencies (Chaddad, 2012).

New Generation Cooperatives (NGC) temper the investment disincentives associated with traditional cooperatives that increase exceptionally in size and/or seek to make exceptionally large investments (Cook and Iliopoulos, 1999). NGCs do this through a more centralized

management structure and stronger property rights. While ownership in NGCs is still mixed, membership is “closed” (i.e., limited to a well-defined farmer group, typically determined by the processing capacity of the cooperative’s plant) and contingent on substantial upfront equity contributions that are appreciable, transferable, and made in direct proportion to an enforceable level of patronage (Chaddad, 2012).

Horizontal integration refers to an investor-owned farm in which assets (notably land) are unified through merger, acquisition, or divestment, resulting in a single firm. If individual farmers continue agricultural production activities on this land, they do so as hired employees.

Figure three summarizes the elements of horizontal coordination, and visualizes this thesis’s second hypothesis: *As the vector of asset specificity, uncertainty, transaction frequency, and externality problems increase from very low to very high for farmer-suppliers in a transaction (grey cells), they will seek to impose greater control through the use of different horizontal coordination governance structures (in brown).*

Figure 3: The horizontal dimension of the coordination framework

	Individual Farmers	Bargaining Association	Marketing Cooperative	New Generation Cooperative	Investor-Owned Farm
<i>Intensity & Mechanisms of Control:</i>	<i>Price</i>	<i>Minimal Equity</i>	<i>Medium Equity</i>	<i>High Equity</i>	<i>Hierarchy</i>
Asset Specificity	Very Low (1)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Frequency	Very Low (1)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Uncertainty	Very Low (1)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Externalities	Very Low (1)	Low (2)	Intermediate (3)	High (4)	Very High (5)

Adapted from: Chaddad (2012); Sartorius & Kirsten (2007, 2005); Peterson, Wysocki, and Harsh (2001); Staatz (1987); Williamson (1981)

3. EMPIRICAL METHODOLOGY AND DATA

3.1. Operationalization of the VC and HC framework

This research uses a case study approach to test the coordination framework's hypotheses. This empirical methodology is particularly advantageous for research contexts in which there is a limited number of observations, contextual variables cannot be easily controlled, there is a serious limitation of reliable quantitative data, and when one research objective is to develop and test theory (Yin, 2008; Sterns, et. al., 1998).

Consistent with TCE studies, the unit of analysis is a transaction (Miranda and Menard, 2014; Williamson, 1985). Particularly, this study examines the horizontal transactions among farmers, together with the vertical transactions between farmers and their downstream buyer. The governance structures that dominate in each case are thus the dependent variable, which are determined by the transaction characteristics (independent variables) of asset specificity, frequency, uncertainty, and externalities that are present in each case.

Following Sartorius and Kirsten (2007; 2005) the framework is operationalized as follows. First, the transaction characteristics of a given case are classified according to the framework categories, and then scored for each actor (i.e. the buyer and farmers) on a five-level scale of intensity, ranging from very low to very high.²⁰ Each transaction characteristic score is then located on the respective (vertical or horizontal) table of the coordination framework, and a point is assigned to the governance structure corresponding to that score.²¹ Finally, the points under each governance structure in each column are aggregated. The VC and HC governance structures

²⁰ Given the inherent subjectivity of this exercise, this thesis takes as a point of reference the grading rationale used in Sartorius and Kirsten (2007, 2005) for sugar and timber case studies.

²¹ In developing the frameworks, the assignment of transaction characteristic levels of intensity to governance structures is based off of TCE theory. It is also developed with reference to Sartorius and Kirsten (2007, 2005). If the grading for a given transaction characteristic corresponds to two possible governance structures, then both are given a score of one for that characteristic.

with the most points in each framework are the two structures predicted to dominate under the given conditions. In cases where more than one structure receives two points, these results suggest a range of suitable structures. An example of this process is provided in Tables eight and nine in Appendix E.

Three modifications are made to Sartorius and Kirsten (2007; 2005)'s framework. First, uncertainty is considered as a single summary transaction characteristic that encompasses multiple types of uncertainty²² in order to avoid weighting this characteristic more than the others, and beyond what TCE theory suggests. Second, the externality principle is added as a fourth characteristic, and assigned scores. Finally, specification contracting is expanded to include resource contracts.

3.2. Data collection

This study examines fifteen case studies of cereal value chains (millet/sorghum, maize, and irrigated rice) in southern and central Mali. Cereal value chains are the focus for several reasons. First, the majority of Malian smallholder farmers grow some type of cereal crop, so its importance to rural households is widespread. Second, cereals enjoy a strong demand in Mali: within the food component of household expenditure, cereal consumption accounts for between 30% and 50% of food expenditures (depending on year and location), with 70% of per capita cereals consumption constituted by coarse grains and rice (Statz, et. al., 2011). Third, cereals occupy a central place in national agricultural policy, which currently prioritizes investments in rice, maize, millet, and sorghum value chains.²³ Finally, the cereals sector is vast enough to

²² This approach is different from Sartorius and Kirsten (2007; 2005)'s expansion of the uncertainty category into eight sub-categories.

²³ As laid out in Mali's Agriculture Priority National Investment Plan (PNISA).

include an interesting variety of governance structures. Focusing on cereal value chains also offers the analytical advantage of holding certain crop-related characteristics relatively constant, such as those related to agro-ecological zones; policies; and physical characteristics, such as those relating to storage and processing. Each case represents a direct commercial relationship between farmers or FOs and a non-traditional cereals commodity buyer.²⁴

Data collection relied on interviews and documents, and is supported by direct observation and photographs (Appendix A presents a selection of these photographs illustrating transaction characteristics). Two sets of interviews were conducted in Mali between May 2014 and in April 2015.²⁵ During the first phase of fieldwork in-depth, semi-structured interviews were conducted with key actors on both sides of the transaction, including the primary purchasing agent of each firm (often the entrepreneur and manager him/herself) or buying institution, and leaders and members of each FO. Key input and service providers were also interviewed whenever possible. The second phase of fieldwork focused on completing and updating information on each case's farmer-buyer transaction relationship, based on the preceding year's production and commercial activities. In addition to interviews, contracts (Appendix C presents an example) and other organizational and business documents were collected, whenever available.

²⁴ This category includes wholesalers, processors, and institutional buyers, and refers to a buyer other than local or ambulant small-scale traders who conduct the majority of transactions with farmers in the conventional Malian marketing system.

²⁵ These are moments in the agricultural calendar that are between primary production seasons and during marketing seasons.

4. HIGHER-REVENUE MARKET SEGMENTS FOR MALIAN CEREALS

This chapter introduces the market segments relevant to the case studies, and thus outlines the opportunities to which the case study actors are responding in structuring their supply chains. The case market segments are generally considered higher-value or higher-revenue, relative to the traditional (local) cereal market. This is because the farmers in these cases add value to the output product (usually by respecting exceptional quality standards, or through bulking, storage, or transport services), for which they usually receive price premiums (for quality) and/or wholesale prices (for bulk sales), instead of market farm gate prices.

In general, demand for Malian cereals is strong and growing, driven by demographic growth, urbanization, increases in purchasing power, and the emergence of other sectors, notably livestock²⁶ (Staatz, et. al., 2011; Diarra, et al., 2011). Increasing incomes and dietary diversification are also driving segmentation in cereal demand, which in turn is stimulating product differentiation through the development and/or application of grades and standards. In these market segments, demand is increasing for cereals of higher quality, processed cereal products, and animal feed (Ibid.).²⁷ Growth of these segments is supported by a developing industrial and semi-industrial processing sector, which was previously largely artisanal. Similar cereal demand growth and transformation is observed in the wider West Africa region, further expanding the prospective market for Malian cereal supply (Staatz, et. al., 2011; Diarra, et al., 2011).

Millet/sorghum farmers in these cases mostly supply institutional markets (this will be further discussed in the next section) and to a lesser extent, wholesalers. One case study features

²⁶ Staatz, et. al. (2011) cited MG reports that more than 30,000 MT of maize grain (which makes up 60 to 70 percent of typical feed rations), are used each year in cattle and poultry feed.

²⁷ Animal feed demand is driven by the growing demand for livestock products, particularly poultry and eggs.

a FO that supplies two small and medium-sized enterprises that process millet/sorghum-based food (“SME millet/sorghum processor”). Virtually all of these buyers accord a premium of 20 to 40 USD/MT above reference market prices for millet and sorghum that meets their standards. The majority of maize farmers market directly to industrial poultry feed processors (“industrial maize processor”) or to wholesalers supplying these same actors. Evidence does not suggest that there is a strong price premium paid for higher quality maize, although some actors report that maize of higher quality sells more quickly. For all of the rice study cases, farmers currently supply the general rice market distributed by both institutional buyers and wholesalers. Institutional buyers nominally impose standards that are more specific than and generally of higher quality than much rice in the mass market. However, findings show that the same actors often supply both segments.²⁸ In a couple of rice study cases, farmers supply industrial and SME rice mills that have the capacity to process for high quality market segments. However, for farmers this appears to make little difference in terms of quality and price since differentiation between categories occurs during hulling (N’krumah, et al., 2011).

²⁸ In the rice-category terminology adopted by this paper, the mass-market segment encompasses imported rice and a wide range of unsorted heterogeneous Malian local rice. Diarra, et al. (2011) estimated that this segment makes up approximately 80-85% of the Malian market. The highest-quality segment of rice can be further broken down into two sub-categories. First, there appears to be some category of intermediate Malian rice that is hand or machine-sorted to contain no more than 25% broken pieces, is often polished, and that contains a low level of impurities (Diarra, et al., 2011, et al., 2011; USAID, 2009). Second, the highest quality category is whole, long-grained, cleaned and polished rice with the percentage of broken grains not exceeding 5% (Ibid.).

5. TRANSACTION CHARACTERISTICS OF MALIAN CEREALS

Interviews of cereal value chain actors allowed for the identification of a range of transaction characteristics that, according to these actors, represent important problems and constraints in their production and marketing activities. This chapter classifies and analyzes these as transaction characteristics, then assigns scores representing their general intensity for different commodities, segments, and actors using a five-point ordinal scale. Appendix A presents select photographs from the Mali cases that illustrate these transaction characteristics, which are referenced as figures throughout the analysis.

5.1. Asset specificity

Asset specificity for individual cereal farmers is generally low (2), given that farm productive assets can usually be deployed towards multiple crops (figures five to seven). Even when short-term investments are made in modern inputs for increased yields, the harvest can be consumed or else sold on a relatively competitive output market. A few exceptions to this generalization pertain to two categories of farmers who face intermediate (3) levels of asset specificity. First, each year rice farmers in the Niger Office (ON) production zone report that they are pressured to market a share of their harvest by March 31 in order to make loan repayments to commercial lenders and water user fee payments to the ON authorities, which are synchronously due when prices are at their lowest. From the perspective of farmers, paddy and rice buyers take advantage of this situation by focusing their buying efforts during this period. A second exception is when millet/sorghum farmers invest additional time and money (e.g., to grow a homogenous variety of certified millet and to avoid mixing in impurities during processing and storage) in order to meet quality standards for SME food processors or institutional buyers (figure eight).

The most important fixed investments owned by interviewed wholesalers are trucks (the case wholesalers owned 5-12 trucks each) and warehousing facilities (with storage capacities ranging from approximately 2,500 metric tons (MT) to 4,500 MT of bagged grains) (figures nine and ten). The specificity of these assets is low (2) insofar as they can be used for a range of trading activities and can also be rented out. This assessment is supported by the relatively strong competition in cereals trading and by the fact that traders usually trade multiple commodities. However, bulk procurements do entail some asset specificity as they are usually made for a large, specific market in view.

SME processors make moderately important investments in semi-industrial equipment: approximately 50,000 U.S. dollars²⁹ (USD) for the SME rice mills, and 400,000-600,000 USD for the SME millet/sorghum processors (figures 11 and 12) . The millet/sorghum processors have made further investments in marketing assets such as packaging, trade shows, and quality certifications. For all processors, the efficient use of their assets involves supply requirements that are not easily met by spot markets. For the millet/sorghum processors the most important factor is quality, while for rice and poultry processors sufficient throughput (quantity) is crucial. In sum, the asset specificity of SME maize and rice processors in these cases are assessed as intermediate (3), while for the millet and sorghum processors it is high (4).

The primary industrial mill examined for several cases (henceforth: “industrial rice/maize mill”) owns equipment to process both rice grains from paddy and animal feed from maize. While it has invested much more in its factory and marketing assets compared to its SME counterparts, it shares similar market conditions and has a greater capacity to substitute Malian cereals with imported commodities if necessary; therefore, it is assessed as having intermediate

²⁹ Currency conversions are made at the representative rate of 1 USD = 500 FCFA

(3) asset specificity. Although other industrial rice mills were not available for interviews, they are assumed to have similar asset specificity profiles. As noted, rice suppliers of institutional buyers do not appear to distinguish between these and mass markets in terms of quality, although institutional buyers appear to apply higher quality standards for millet and sorghum due to a lower baseline quality for these commodities. These buyers also have the capacity to import cereals and their asset is thus assessed as low (2). Table two summarizes the intensity grades for asset specificity for different farmers (brown rows) and buyers (blue rows).

Table 2: Asset specificity scores

Value Chain Actor & Score	
Rice Farmers	3
Maize Farmers	2
Millet/Sorghum Farmers	3
Wholesalers	2
SME Rice Processors	3
SME Maize Processors	3
SME Millet/Sorghum Processors	4
Industrial Rice Processors	3
Industrial Maize Processors	3
Institutional Buyers	2

5.2. Frequency

Although cereals are less perishable compared to other crops, individual farmers commonly market small volumes of cereals at multiple points throughout the year in order to repay debts and meet household cash needs as they arrive. SME processors and wholesalers also cited

varying limitations in obtaining commercial credit³⁰ and warehousing and therefore must make multiple transactions per year. While institutional buyers and industrial rice mills have greater throughput needs, they have fewer financing and logistical constraints, and thus do not typically transact more than twice with a supplier in a given year.

The overall intensity of the frequency problem for farmers (aspiring to earn higher margins by supplying buyers beyond the local market) and buyers (attempting to source sufficient inputs from small, dispersed farmers) largely depends on the level of asymmetric scale between these two actors in a given case (figures 13 to 15). Thus, farmers and buyers face a low (2) level of transaction frequency where the buyer is an SME maize, millet/sorghum, or rice processor; an intermediate (3) level where the buyer is a wholesaler or rice mill; and a high (4) level where the buyer is an industrial processors or institutional buyer. Table three summarizes these scores.

Table 3: Frequency scores

Value Chain Actor & Score	
Farmers Supplying SME Maize & Millet/Sorghum Processors	2
Farmers Supplying SME Rice Processors, Wholesalers	3
Farmers Supplying Indus. & Institution. Buyers	4
Wholesalers	3
SME Rice Processors	3
SME Maize Processors	2
SME Millet/Sorghum Processors	2
Industrial Rice Processors	4
Industrial Maize Processors	4
Institutional Buyers	4

³⁰ Interviews and multiple studies confirm that wholesalers and SME processors face difficulties accessing sufficient lines of commercial credit, making cereals procurement and risk management difficult for these actors. Traders report as their number one constraint the access to a line of commercial credit that is both timely and sufficient with respect to the cereal transaction necessitating the loan.

5.3. Uncertainty

There are four inter-related types of uncertainty present in farmer-buyer transactions: uncertainty related to cereal prices, cereal supply, policy interventions (in particular: institutional purchases and distributions, and trade policies and practices), and contract fulfillment and enforcement. These are described below, followed by a summary analysis of their intensity for different actors.

5.3.1. Uncertainty of price

Cereal prices in Mali exhibit two forms of price variability that may discourage investment and render shorter-term production and marketing decisions difficult for cereal actors. First, cereal markets demonstrate intra-annual price variability due to production seasonality and on-farm storage limitations. This variability has a discernable pattern, with prices reaching their minimum after harvest and their maximum during the lean season. Diarra, et al. (2011)'s analysis of average inter-seasonal prices from the year 1990 to 2000 estimates that each year consumer prices increase 16%, 21%, 27% and 28% between the lowest and highest points for rice, millet, maize, and sorghum, respectively. Cereal prices also exhibit an inter-annual variability. This is especially the case for coarse grains, for which prices have sometimes doubled from one year to the next (Ibid.). The price of rice also fluctuates up to 50% from one year to the next; however, in general, its fluctuations tend to be less pronounced due to the non-dependence of irrigated rice on seasonal rainfall and because it is more broadly traded internationally than millet and sorghum (Ibid.). Inter-annual price variability does not have any significantly detectable trend, because it appears to depend on a number of unpredictable factors,

including farm-level productivity, farmer marketing decisions, and Malian Government (MG) policy, factors which are discussed below (Kaminski, et. al., 2013; Diarra, et al., 2011).

5.3.2. Uncertainty of supply

Uncertainty of cereal supply is a determinant of price variability, but stands on its own as an important type of uncertainty for buyers seeking to obtain sufficient throughput for their operations, and for farmers seeking to meet household cash and food needs. While limited data preclude more precise estimates, it appears that cereal commercialization rates in Mali are highest for maize and rice (ranging up to 60% in a given year) and lowest for millet and sorghum (ranging up to 20% or 30% in a given year, depending on the estimate) (Staatz, et. al., 2011; Diarra, et al., 2011; Kaminski, et. al., 2013; Ministere de l’Agriculture, 2009; Stathacos, et al., 2014).

Supply uncertainty is itself related to three farm-level problems frequently cited in interviews: climate variability, uncertainty accessing input credit, and possible uncertainty accessing quality inputs. First, erratic rainfall patterns (both rainfall shortages and floods) vary over time and geographic space. At the farm level, these climactic events can reduce yields in some cases and in other cases partially or totally destroy crops (figure 16). At the country-level, they can cause national production to oscillate between surplus and deficit from one year to the next (Diarra, et al. 2011). Of the dry cereals, maize requires the most water and is the most susceptible to drought, while millet requires the least amount of water (Memento de l’agronome, 1984). Irrigation systems, under which more than half of Mali’s total rice is grown, reduces the rice value chain’s susceptibility to climactic shocks (Staatz, et. al., 2011).

The second farm-level problem affecting supply uncertainty is unreliable access to credit. Farmers reported difficulties accessing short-term credit that allows them to manage household

liquidity constraints and to purchase equipment and modern inputs, such as improved seeds, fertilizer, pesticide, herbicide, fungicide, and hired labor (figures 16 to 19). Limited medium-term loans also constrain farmers from making investments in technologies that increase farm productivity, add value to raw cereal products through quality improvements and other processing, and scale up marketing capacity. Although Mali's financial sector includes over a dozen commercial banks and dozens of rural Micro-financing organizations (MFO) with over 800 rural outlets, MFOs employ risk-reducing measures that effectively prevent many farmers from qualifying for a loan (Staatz, et. al, 2011). Terms (e.g., loan size, interest rates) may vary even within the same lending organization depending on whether the applicants have a history of patronage with the bank and a loan guarantee or physical collateral, with a strong preference for land titles. Interest rates for short-term commercial and input credits are on the order of 10-12% annually (Staatz, et. al, 2011). For their part, MFOs suffer from high transactions costs (from dispersed borrowers and small transaction amounts) a diversity of risks, limited capacity to manage and monitor loans; and limited funds, which restricts loan amounts and puts upward pressure on interest rates (Staatz, et. al, 2011; USAID, 2012; Diarra, et al., 2011). ON Rice farmers and maize farmers from the Malian Textile Company (CMDT) production zone in Sikasso may have advantages in accessing credit due to higher concentrations of lenders and higher levels of grain trading, accompanied by historically stronger extension programs. However, these zones are also not without challenges.³¹ Uncertainty of contract fulfillment and enforcement is also closely related to credit access problems, and is discussed more fully below.

³¹ For example, ON farmers report that limited credit options and strict terms force them to dump product on the market at inopportune times during the commercial season. Staatz, et. al. (2011) also report high rates of farmer indebtedness in the ON. In Sikasso, multiple cooperatives had difficulties accessing input loans from one commercial bank when a donor loan guarantee was withdrawn at the end of a development project, despite a three-year working history that had been developed.

A third farm-level problem possibly affecting supply uncertainty is farmers' uncertain access to quality inputs and services, especially chemical fertilizer, and improved seeds and extension services. This is first and foremost caused by the uncertain access to financing discussed above. Following cereals market restructuring, the MG placed responsibility for extension and input provision on farmer organizations; thus, access to inputs is limited to those FOs that successfully access credit (Staatz, et. al, 2011). However, there is also some degree of unpredictability in the seed, fertilizer, and extension system. For example, farmers frequently reported that in some years, MG bureaucratic delays in obtaining subsidized fertilizer often retarded planting. The certified seeds market is also troubled by problems, including shortages in commercial and foundational seed.³² Access to inputs appears best for maize and rice; perhaps due to the historical support FOs in the ON and CMDT zones have received, the thickness of input markets for these crops, the high dependence of these crops of fertilizer, and their greater market orientation. In contrast, purchased inputs are rare in the millet and sorghum value chains.³³ Another issue is the problem of quality control with regards to inputs, due to the lack of a system for monitoring fertilizer, and lack of legislation concerning fertilizer quality and labeling (Staatz, et. al, 2011). Finally, primary interviews report that farmers often get poor yields even when fertilizer and improved seeds are used. Even when technical packages are well adapted to farm realities, it is possible that farmers also do not always apply them correctly. During the interviews, farmers commonly expressed bewilderment to unknown variables that could seem to negative affect yields each year, despite efforts to follow best practices.

³² Seed regulations in Mali do not yet allow for the accreditation of the private sector to release foundation seeds and certify commercial seeds; meanwhile, the MG itself has a limited capacity to do so (USAID, 2012).

³³ Only up to 10% of millet and sorghum seeds are commercialized through formal channels, compared to 20% for maize, and about 85% for rice, with both supply and demand highly dependent on government and donor projects (Staatz, et. al, 2011).

Finally, across the value chains farmers and SME processors commonly reported technical breakdowns of production, post-harvest, and processing equipment as important recent shocks (figure 18). When these unexpected incidents occur, they greatly disrupt productive activities, are usually costly to fix or replace, and sometimes are difficult to resolve when technicians are not available.

5.3.3. Uncertainty of policy interventions

In Mali, institutional purchases, sales, and distributions of rice, millet, and sorghum are important features of the market landscape. The Malian Office of Agricultural Products (OPAM) is the primary institutional buyer. During the 1990s, OPAM was restructured from a para-statal company holding the legal monopoly on all cereal commerce³⁴ to an agency charged with managing a large national cereal stock, of which the current capacity is 65,000 MT. OPAM runs two programs: the first purchases and stocks up to 35,000T of Malian millet and sorghum per year for first-response food aid distributions in drought periods, while the second program purchases, stocks, and resells up to 30,000T per year of millet, sorghum, and rice in order to stabilize intra-seasonal market prices (Diarra, et al., 2011). The World Food Program (WFP) and, to a lesser degree, NGOs also make cereal market interventions through the distribution of cereals that are either imported, or procured off of Malian markets. The distribution programs are focused on Malian households suffering from acute and long-term food insecurity. Diarra, et al. (2011) estimated that leading up to 2011, these volumes fluctuated around 5,000 MT per year.

The interviews carried out in 2014 highlight several unpredictable features of these activities. First, the occurrence, timing, and magnitude of institutional purchases, payments, and food

³⁴ However, due to a large and persistent parallel market, OPAM never controlled more than about 20% of total grain transactions (Humphreys, 1986).

distributions are unpredictable, although the inherent linkage of these programs to climatic and price volatility triggers lend an unavoidable uncertainty to their patterns. Second, the market actors from whom these institutions procure commodities have not always been predictable, and can appear to shift in preference between domestic and external markets, between wholesalers and FOs.³⁵ Third, although there is no conclusive evidence supporting the argument, a range of interviewed rice actors perceive that WFP food distributions sometimes deflate rice market processes for rice.³⁶ Fourth, OPAM has historically had a poor record of making timely procurements and payments. Because of their magnitude, late payments by OPAM can have rippling consequences through value chains, not only affecting the direct supplier, but his/her own suppliers as well.

Unpredictable MG deviations from international and regional trade policies are another type of policy uncertainty present in cereal transactions. Since the 1990s market reforms, the domestic cereal market is better integrated internally. However, despite free-trade agreements signed within the Economic Community of West African States (ECOWAS) and the West African Economic and Monetary Union (UEMOA) zones, actual integration is less than complete between Mali and its neighbors (Staatz, et. al., 2011; Diarra, et al., 2011).³⁷ In practice, policies are changed or not consistently respected, ostensibly driven by food security-focused concerns.

³⁵ WFP procurement choices are normally dictated by market prices at the time of procurement. Thus, rice aid is usually imported (although exceptions are sometimes made based on donor preference), and millet and sorghum from Malian from FOs and wholesalers. WFP has built a strong local procurement program, Purchase for Progress (P4P), that helps develop the marketing capacities of its FO partners. Historically, wholesalers have been the primary partners of OPAM tenders (for both sales and purchases), especially for rice (Diarra, et al., 2011). However, in recent years OPAM has followed the P4P approach in attempting to make its purchase tenders more accessible to farmer organizations, and has furthermore developed a management code for the SIE to stabilize procurement practices (Diarra, et al., 2011). The fieldwork allowed for the observation of the implementation of these reforms, as several large FOs were in the process of fulfilling OPAM rice grain contracts.

³⁶ One oft-cited example of rice distributions supposedly affecting markets were the 2014 distributions in central and Northern Mali.

³⁷ This is especially problematic, given that Mali's land-locked state means that there is a large margin between import and export parity prices, and thus national prices can fluctuate widely before being tempered by trade.

First, since 2008 the MG has enacted both official export bans and non-official (non-tariff) trade barriers to retain cereal supplies and keep consumer prices down (Staatz, et. al., 2011).³⁸ Aside from contradicting international trade agreements, these policies effectively withhold potential tax revenues from the MG, prevent law-abiding traders from expanding their markets, constrain farmers from obtaining higher remunerative prices, and contribute to an environment of corruption (Kaminski, et. al., 2013; Stathacos, et al., 2010). Second, since 2002-03, the MG attempts to compensate for years of poor rice production³⁹ by sometimes restricting exports, and exonerating commercial rice imports from tariffs, customs, and the normal value-added tax (VAT) for importers agreeing to ceilings on wholesale prices (Staatz, et. al., 2011; N'krumah, et al., 2011).⁴⁰ Diarra, et al., (2011) estimate that rice imports range from 125,000 MT to 205,000 MT per year, two-thirds of which take place outside of normal protection according to USAID (2009). Although N'krumah, et al. (2011) argued that the presence of imported rice has less of an effect on rice prices than local rice's "own overabundance," imported rice does have a stabilizing effect on local rice prices during the lean season, and import taxes are sometimes countercyclical to local rice production. For their part, ON farmers and non-trading farmers commonly blame unattractive rice prices on imports.

³⁸ Despite these restrictions, opportunities for arbitrage between Malian and export markets have not stopped many traders, most of whom continue to export without authorization, but at increased transaction costs (from illicit bribes/extortion and roadway roadblocks/checkpoint) (Diarra, et al., 2011; USAID, 2012, citing Borderless).

³⁹ Historically, imports of millet, maize, and sorghum have been minimal except for drought-years (Staatz, Dione, and Dembele, 1981).

⁴⁰ UEMOA calls for a 10% tariff on rice while allowing each country to set its own VAT. USAID (2009) calculates that the "normal" level of protection from tariffs, VAT of 18%, and other customs duties, is 32%. One FO leader succinctly captured what many perceive to be a gross incoherency in MG trade policy implementation: "the government lets rice come in, but not go out."

5.3.4. Uncertainty of contract fulfillment and enforcement

Another important source of supply uncertainty is the uncertainty that value chain partners will fulfill trading and credit agreements and, in the event that they do not, the related unreliability of Mali's contract enforce regime. Historically, trade and credit provision in Mali was based on a system of strong social networks and verbal contracts. Liberalization of the cereals sector increased traded volumes and market entries, and the old system has faced new challenges as cereal actors commonly find themselves trading outside their immediate networks (Staatz, et al., 1989). On one hand, regulations and implementing institutions around contract enforcement appear quite strong.⁴¹ However, interviewed cereal actors report that, when contracts (including written) are breached, their recourse to recovering losses or debts is usually limited, due to a reportedly unreliable judicial process and high costs. Even if an actor obtains an executable order, its actual execution often presents an entirely new set of problems. Bailiffs, the private executioners of court orders, are not abundant, charge service fees of up to 10% of the collected amount, are reportedly sometimes corrupt, and commonly face difficulties in finding and physically seizing a debtor's property.

Interviews suggest that informal institutions may partly moderate uncertainty related to collecting on debts and losses. For example, the police or gendarmerie can be engaged to imprison an alleged debtor without a court order. Individuals and organizations also often forbear

⁴¹ There is an existing legal framework under the Organization for the Harmonization of Business Law in Africa (OHADA) supporting both oral and written contracts, and sixteen first-level trial courts as well as regional commercial courts and other formal bodies to implement this law (USAID, 2012). Additionally, an arbitration center and chambers of commerce are other formal institutions that can help resolve disputes. However, if any formal institution is engaged to enforce contracts USAID (2012) reports that it is usually the trial court system. They also report that there are few commercial lawyers in Mali, and the majority of disputes are handled without engagement of a lawyer. USAID (2012) found that the most common contractual issue, unpaid debts, can be efficiently resolved through a court-issued payment injunction when the case is supported by a written contract, or else a by verbal contract evidenced by witnesses and other forms of documentation. The study reports that the trial court in Niono is particularly efficient, often able to issue an order within a month of filing, possibly in part because of the dual production season and high level of commerce that characterizes the ON zone (USAID, 2012).

debts and even forgive debts that are incurred for reasons outside a debtor's control, especially when these practices can preserve or strengthen a business relationship. Nonetheless, these informal enforcement means are not always available or sufficient for certain disputes. The interviews found several cases of large contract disputes between FOs and buyers that were never resolved and never taken to court. Additionally, thin credit markets are probably partially due to the weak information and contract enforcement environment in Mali. Interviews and studies document that the cereals sector has a very troubled history of bad debt: cases across all commodities, value chain actors, and production zones, resulting from both strategic default and events beyond the debtors' control.

5.3.5. Summary of uncertainty scores

Malian cereal farmers face an intermediate (3) level of uncertainty due to the production, output market, and contract-related issues cited above. Supply uncertainty is highest for rain fed coarse grains, while the occurrence of unpredictable and important market interventions is most pronounced for rice. Wholesalers' have a high exposure to market volatility as mid-stream value chain actors; however, because their value addition activities involve relatively little technical uncertainty as compared to farmers and processors, their overall uncertainty level is also graded as intermediate (3). SME rice mills are exposed to markets in a similar way to wholesalers, but also face production uncertainties, and are therefore scored as high (4). Although SME coarse grain processors are affected by cereal volatility on the supply side, the processors in these cases procure limited amounts of raw commodity compared to their rice counterparts, and furthermore their market demand is not as affected by the sources of market uncertainty described above. They are thus scored as intermediate (3). The uncertainty faced by industrial rice and maize mills and institutional buyers is moderated by their large logistical and financial capacity, and is thus

scored as low (2). Although institutional actors’ operations are largely based on volatile price and food security indicators, their size and political connections would seem to moderate uncertainties related to MG interventions and contract enforcement. Table four summarizes the intensity scores for uncertainty.

Table 4: Uncertainty scores

Value Chain Actor & Score	
Rice Farmers	3
Maize Farmers	3
Millet/Sorghum Farmers	3
Wholesalers	3
SME Rice Processors	4
SME Maize Processors	3
SME Millet/Sorghum Processors	3
Industrial Rice Processors	2
Industrial Maize Processors	2
Institutional Buyers	2

5.4. Externalities

The major externality problem present in cereal transactions is quality debasement, which begins at the farm level. According to millet/sorghum processors, rice millers, and institutional buyers, common quality problems include high degrees of impurities,⁴² heterogeneity of grain varieties (for millet/sorghum), and high humidity levels (figures 20 to 22).⁴³ However, downstream quality debasement is also sometimes a problem for millet/sorghum and rice farmers

⁴² Impurities can include pebbles, bran, straw, dust and dirt, flour (as a result of poor processing) and even insects.

⁴³ Technical causes for millet/sorghum and rice quality problems are insufficient drying, inappropriate threshing (for millet/sorghum), the shelling of paddy using inefficient but highly-accessible mobile hullers (for rice), poor storage and conservation practices, and the mixing of seed and grain varieties (Kaminski, et. al., 2013; N’krumah, et. al., 2011; Diarra, et. al., 2011; USAID, 2009).

targeting higher-end markets. Farmers seeking to access these segments sometimes reported that handlers and traders commonly mix varieties and qualities of these crops in transport, storage, and resale.⁴⁴

Some processors additionally reported that the actual weight of purchased cereal volumes commonly falls short of their assumed marketed weights. While a single reason for weight problems could not be confirmed, actors suspected a number of causes, including: poor sack quality causing grain leakage, high impurity rates that add weight, water loss during storage and transport, weight or sack losses due to the negligence of handlers, weighing errors due to the downstream use of different old or lower quality scales (figures 23 to 24), and the intentional skimming of a kilogram or two.

For rice, irrigation systems in the ON are troubled by stakeholders' (the ON, private contractors, and FOs alike) low compliance with canal maintenance regulations (figures 25 to 26). As a consequence of this mutual neglect, late flooding plagues the system, a high degree of water loss, and inadequate drainage leading to increased production costs, as well as production and/or quality loss (Staatz, et. al., 2011).

In sum, the level of farmer externality problems is assessed as very low (1) for maize, and low (2) for millet/sorghum and rice. Among the buyers, low quality cereals pose the most problems to millet and sorghum processors, rice millers, and institutional buyers, all of whom must maintain input standards for technical, commercial, or political/policy reasons (for

⁴⁴ This may be a consequence of the low levels of marketed surplus produced by most farmers, which make it unprofitable for collectors to separate production by producer or by quality; rather, everything gets pooled together. This plays a role in reducing the incentive of farmers to improve quality, as they will not get paid for higher quality if their product is mixed with that of others who produce a lower quality or a different variety. Several interviews also cited problems in which transporters stole grains, lost grains during transport (due to poor loading), damaged grains during transport (by mixing with livestock or liquids), delayed or refused pick-up at isolated sites despite previous commitments.

institutional buyers).⁴⁵ These actors and wholesalers supplying these markets thus face an intermediate (3) level of externalities. Of all cereal buyers, maize traders and livestock feed processors appear to be the least preoccupied with quality issues. While maize buyers state that they do maintain minimum quality levels, they report that Malian maize farmer practices do not generally debase grains below these thresholds and thus face low (2) externalities, along with maize wholesalers.⁴⁶ Table five summarizes the intensity scores for externalities.

Table 5: Externality scores

Value Chain Actor & Score	
Rice Farmers	2
Maize Farmers	1
Millet/Sorghum Farmers	2
Rice, Millet/Sorghum Wholesalers	3
Maize Wholesalers	2
SME Rice Processors	3
SME Maize Processors	2
SME Millet/Sorghum Processors	3
Industrial Rice Processors	3
Industrial Maize Processors	2
Institutional Buyers	3

⁴⁵ Interviews with two SME processors indicate that the primary problems with the quality of millet/sorghum, in descending order, are: the low degree of cleanliness, heterogeneity of grains, and unstable/insufficient quality. Impurities can include pebbles, bran, straw, dust and dirt, flour (as a result of poor processing) and even insects. Technical causes for these quality problems are rudimentary post-harvest processing, inappropriate storage and conservation practices, and the mixing of seed and grain varieties (Kaminski, et. al., 2013). Following the sequence of rice production and post-harvest processing, primary farm-level quality-debasing practices include the mixing of varieties, the inappropriate drying of paddy, the shelling of paddy using inefficient but very common mobile hullers, and inappropriate storage. The various results of these practices are low hulling yields, a high percentage of broken grains, and discolored rice grains (N’krumah, et al., 2011; Diarra, et al., 2011; USAID, 2009).

⁴⁶ An important factor that might explain this dynamic is that most maize in Mali is grown in cotton-producing zones by farmers who have historically received a great deal of support from the CMDT and other agencies, which has resulted in better access to mechanical threshers, village-level storage, and maize-focused training.

6. GOVERNANCE STRUCTURES USED IN MALIAN CEREAL VALUE CHAINS

This chapter describes the different combinations of VC and HC governance structures used in Mali to link cereal farmers to higher-revenue output market segments, according to the 15 case studies.⁴⁷ While there are several possible ways to organize the Mali cases, they are presented here by HC structure type, beginning with the individual farmer category and progressing to more complex farmer-initiated forms. The research finds notable differences between small village-level marketing cooperatives and large regional marketing cooperatives, which are distinguished below. The research also documents an additional category of HC structure, the service provider FO, which is also discussed. Neither this study nor past studies encountered a case of NGCs in Malian cereals. Finally, because of the research's focus on smallholder farmers, full horizontal integration (large investor-owned farms) is not studied. The summaries below also provide information on the VC structures that are used in combination with each case's HC structure. VC structures range from spot markets to resource contracts and possibly some alliances, with marketing contracts the most common VC structure. However, there is also some important variety within this category.

6.1. Individual farmers

In the Malian cereal sector, the most common coordination system linking farmers to markets is that of the collector/trader system that emerged following liberalization (USAID, 2009). Here, individual farmers or simple village FOs sell small quantities of grain throughout the year to local traders (who are often themselves farmers) or collectors working within a larger trader's

⁴⁷ For ease of reference, each case is encoded by commodity type (M for maize, R for rice, M/S for millet/sorghum) and number. Except for government and development organizations, the proper names of case actors are replaced with generic names to maintain confidentiality.

business network. Verbal spot purchases dominate throughout this trading circuit, usually supported by personal relationships and trust. This traditional trading system offers some advantages: farmers with physical access to markets have a way to spontaneously make small transactions to meet cash needs, and actors are not burdened by the governance costs of complex coordination structures. However, there are also a number of disadvantages, among them: quality, commodity homogeneity, and weight are not strictly monitored, and farmers receive the going farm gate price or else whatever may be imposed by the buyer. For these reasons and others, a number of actors in Mali have organized individual farmers and structured their vertical relationships with buyers, and sometimes also with farm input/services providers. Below is a description of two such cases, initiated by an egg producer and a social enterprise service provider.

Case M1. SME egg producer is a Sikasso-based firm that produces a daily average of 6,900 eggs. It has diversified into chicken feed processing to support its primary layer activity, and in 2012 began developing a private maize supply network in order to meet its growing need for maize as an important input. Motivated by prior maize market price shocks, the objective of the chicken feed operations was to have quality maize without supply breaks. The firm provides inputs on credit (fertilizer, hybrid maize seed), technical assistance, and access to a threshing machine to 21 maize farmers producing on 62 ha of their own land, and collects the maize after harvest. The farmers are spread across three villages and have discussed with the firm the possibility of creating an FO to facilitate communication, information sharing, and access to banking services, but have not yet done so. No written contracts are used, but a 20 to 50 USD/MT markup over the Sikasso market price (already higher than the farmers' local farm gate price) have thus far helped avert cases of side-selling and to ensure that more than half

(approximately 180 MT in 2014-15) of the poultry firm's 264 MT/year needs in maize are met. The firm also owns a 25 hectare (ha) maize farm adjacent to the layer facility, which further contributes to its maize throughput needs. In 2014-15 it began operations of a self-funded (40,000 USD) semi-industrial feed mixing plant with a theoretical capacity of 15 MT/day of poultry feed per day, and which also fabricates paper-based egg cartons. However, actual feed production in this plant is currently only one to two MT/day, reportedly due to factory space limitations and the costs and availability of other (non-maize) inputs.

Case M2. myAgro is an American social enterprise⁴⁸ that provides a fee-based packet of inputs (unsubsidized fertilizer, certified seed), technical assistance, and limited marketing assistance to maize farmers in the Koulikoro region. Enrolled farmers pay for various maize packet sizes (the average is 0.5 ha for women and 1 ha for men) through an innovative SMS-based micro-savings mechanism. While market access has always been conceptualized as a core element of myAgro's "grow more, sell more" packet of services, it is still experimenting with different buyers (mostly processors), farmer incentives structures, and aggregation approaches. In 2013-14, only 10% of the enrolled farmers opted to deliver a total of 25MT towards a small written marketing contract with the industrial rice/maize processor. myAgro's original farmer-organization approach was to work directly with existing networks of FOs, but it has since switched to a strategy of appointing a "resource person" in each village who organizes enrolled farmers for meetings and events.⁴⁹ Current challenges include sustainably covering the high

⁴⁸ The term social enterprise is here used to distinguish myAgro from the typical project-based NGO model supporting farmers in Mali. A social enterprise operates a permanent program of fee-based services, usually with the goal that fees eventually cover variable costs.

⁴⁹ However, there is a tendency of enrolled women farmers to organize themselves into groups of at least 15.

variable costs of delivering goods and services to disbursed farmers,⁵⁰ limited local supply of certified seed and skilled employees, and the limited availability of drought-insurance mechanisms. While myAgro's startup and expansion (currently, programs in Mali and Senegal staff 210 employees) have been strongly supported by multiple grants, its strategic plan targets self-financed operational costs by 2020.⁵¹ However, the Director acknowledges that meeting this deadline will be difficult without raising margins beyond the current 20% on input packets.

6.2. Village bargaining organizations

MG agricultural policy calls for farmer organizations to play an important role in the management of credit, input procurement, extension, and marketing (Staatz, et. al, 2011). Mali's most common and basic FO structure is the village-level association (AV) or village-level cooperative ("coop"). Legally, these two organizations have important differences. As the lowest level of territorial administration, AVs have a light governance structure and are intended to provide a wide range of services to their members; however, they are not legally permitted to engage in business on behalf of members as a separate legal entity, nor are they permitted to capture and redistribute profits from business transactions. On the other hand, coop structures have a clear specification of roles and responsibilities of members and leadership, a more sophisticated governance structure that enables the collective ownership of assets, and a separate legal identity that empowers these FOs to enter into contracts while insulating management and members from excessive exposure to associated risks (USAID, 2009).

⁵⁰ In 2014 myAgro made 90 separate deliveries to 90 villages. The effort required all regular staff, additional temporary staff, and transport costs of \$3/farmer. Consequently, 2015-16 policy stipulates that new villages entering the program must have at least 75 farmers/village, and will be assigned collection points no farther than 10km from the village.

⁵¹ In 2013-13 internal revenues covered 24% of operations, with a \$152 subsidy per farmer.

With reference to the HC framework, AVs translate strictly as bargaining associations. On the other hand, coops in Mali have the legal foundations to act as either bargaining associations or as marketing cooperatives. In reality, because fulfilling the role of a marketing cooperative demands a certain level of financial, managerial, and organizational capacity, coops in Mali often merely play the role of bargaining association. The two cases presented below involve AVs and coops that transact directly with downstream buyer firms as bargaining associations. These village-level FOs serve as a platform for collective decision-making, disseminating information, interfacing with a buyer, collecting credit reimbursements or marketed volumes, facilitating payment to members, and sometimes also offering minimal production, processing, or warehousing services.

Case RI. ON SME rice mill is a 50,000 USD plant consisting of a semi-industrial rice hilling machine, size graders, and warehouse. It reports that its theoretical milling capacity is up to 27 T/day, which is under-exploited at a 7% utilization rate.⁵² The plant is located on a 532 ha parcel of irrigated land, for which the mill owner obtained a 30-year lease from the ON in 2007. The owner grows paddy on 100 ha of the parcel, while the remaining 430 ha is sub-leased at no cost to three village bargaining associations consisting of farming families who emigrated from the owner's own commune of origin. Since 2008-09, the mill obtains input credit from a bank, MFO, or input providers to provide MG-subsidized fertilizer to these and other village bargaining associations from three ON communes (Dogofry, Sololo, and Diabaly). The mill is reimbursed by farmers in paddy according to a previously agreed (verbal) purchase price consistent with that paid by the local rice syndicate. In the past, the mill has also lent rice to farmers during the hungry season and guaranteed one FO's bank loan for the purchase of production equipment.

⁵² It reports milling approximately 700 MT of paddy/year in 2010-11 and 2011-12, with a drop to 450T in 2012-13 due to national insecurity problems.

The mill's primary buyer is OPAM (since 2010-11 OPAM has purchased cereals three different years through written marketing contracts ranging from 140 MT to 300 MT), followed by several Bamako wholesalers buying in 30 to 40 MT lots. Current challenges include access to sufficient credit to buy additional paddy, breakdowns of milling equipment, and limited on-site storage (which can hold up to 400MT of paddy rice or 100MT of milled rice). To better exploit his mill, the owner is attempting to expand his line of credit to provide inputs (subsidized fertilizer, seeds, herbicide) to a total of 20 village bargaining associations through written contracts for up to 1,350 MT of paddy throughput.⁵³

Case R2. In 1994, ON rice paddy and grains wholesaler began providing inputs (fertilizer and sometimes cash for field labor and threshing) to individual farmers in his ON commune of origin, where he himself also grows paddy. In 2002 he began working with village bargaining associations to facilitate farmers' access to subsidized fertilizer, reduce lending risks, and for easier contract management. Since 2014-15, he has also loaned millet to farmers to discourage them from consuming or selling off paddy during the hungry season. Prices are negotiated and fixed at signing of written resource contracts, and some farmers sell to him additional paddy after harvest at spot prices. In the past, he has also made marketing contracts with village cooperatives to support their own input credit applications. These systems have been motivated by the desire to secure paddy stocks during the very short and competitive rice commercial season, which lasts only three months. He reports that his FO suppliers are well organized, and thus quality is not a major concern. The wholesaler generally cites financing as his number one constraint: his operations are financed by a combination of personal funds, limited input credit from a fertilizer company, and a limited line of commercial credit occasioned and supported by sales contracts.

⁵³ The U.S. Agency for International Development (USAID) is providing technical assistance.

Since 2012-13 his largest client is the industrial rice/maize processor, with which he annually makes written marketing contracts ranging from 6,000 MT to 10,000 MT of paddy, followed by a small number of other wholesalers. In 2015-16 he reports that he is advancing 3,000 MT of fertilizer to more than 20 FO suppliers. He has furthermore collaborated with some FOs to obtain contracts with OPAM totaling 3,000 MT of grain.⁵⁴

6.3. Village marketing cooperatives

The FOs featured in the below cases have each developed strategies, competencies, and asset bases that have allowed them to function as marketing cooperatives. Without exception, this development has been due to the direct technical and material assistance of multiple external project partners. Consequently, the more dependent of these FOs have serious difficulties sustaining the core of their collective activities when project assistance comes to an end. The more advanced of these FOs persist without projects, but mostly remain dependent on outside assistance for further growth and development. Another unifying characteristic of the cases is that they mostly operate at a village-level. While the marketing cooperatives in two of the cases have nominally federated into a regional union, these organizations are largely nominal, serving mostly a bargaining function when market opportunities and/or project assistance allow.

Cases M3, MS1. From 2007 to 2013, USAID/Mali's flagship agricultural development program built a cereals value chain strategy based on capacity development and a tripartite collaboration between marketing cooperatives, wholesalers, and Mali's National Agricultural Development Bank (BNDA). Each year, project-supported FOs entered into marketing contracts

⁵⁴ The motivation for this arrangement is that the wholesaler was under the impression that OPAM will only conduct business with farmers this year, while he esteems that only he has the logistical capacity to aggregate and deliver. This capacity includes owned warehousing capacity of 4,000 MT in Niono plus 5 "big" warehouses in Dogofry, in addition to six 30-40 MT trucks.

with a wholesaler. Quantities and quality were fixed at signing, with an addendum allowing for the post-harvest negotiation of prices. The prospective market, project oversight, and a guarantee fund put in place by USAID supported the FOs' applications for input credit (for the bulk purchase of fertilizer), which was reimbursed through bank-domiciled sales payments. Two post-project cases are examined here for the value chain partnerships developed in two zones of the Sikasso region: maize in Sikasso, and millet/sorghum in Koutiala.⁵⁵

The Koutiala wholesaler specializes in millet and sorghum, for which his biggest buyers are institutional buyers, followed by other wholesalers in Mali, Senegal, and Ivory Coast. The wholesaler estimates that in a recent good year he has traded approximately 30,000 MT in coarse grains,⁵⁶ and partly attributes worse years to failures to win contracts with OPAM. Late payments from OPAM are another recurring problem, which sometimes affect his respect of purchase commitments with, and timely payments to, farmer suppliers. Other challenges in working with farmers have included their unpredictable marketed volumes (which he links to unpredictable access to credit for fertilizer), and farmers' limited capacity to collectively negotiate prices and aggregate volumes for pick-up. He continues to purchase coarse grains through written marketing contracts (quantities ranging from approximately 5 MT to 70 MT) with village and federated FOs, which are usually mediated by development projects during the September to March period, and include a 10 to 30 USD/MT markup above the local farm gate price. One of these FOs is a village marketing cooperative in Koutiala, one of many other USAID-supported FOs. Unable to secure credit from BNDA following the withdrawal of

⁵⁵ Since the end of this project, others projects with similar value chain approaches have worked with the same wholesalers, and often with the same farmers. Such subsequent programs have been funded by Alliance for a Green Revolution in Africa, the International Fertilizer Development Center, and again by USAID.

⁵⁶ His owned and rented storage capacity is approximately 4,610 MT (with another 3,000 MT warehousing complex in construction), plus 12 trucks, and a 800,000 USD line of commercial credit from BNDA.

USAID's guarantee fund, the marketing cooperative currently relies on savings for fertilizer purchases but continues to market to the Koutiala wholesaler through marketing contracts.⁵⁷

The Sikasso wholesaler specializes in maize trade, of which total volumes have increased over the last four years to reach 5,800 MT.⁵⁸ His business is heavily built on livestock feed market segments, with the industrial rice/maize processor currently serving as his the primary client, followed by Senegalese and Malian wholesalers and other feed processors. Primary challenges include access to sufficient commercial credit and unpredictable OPAM markets. He reports no problems with maize quality and states that he pays no price premium for quality. A Sikasso maize farmer's union is one of the FOs supported by USAID. During the 2013-14 season, only one of the union's member cooperatives successfully obtained an input loan (for 4,000 USD) from the Sikasso BNDA branch. The remaining cooperatives then approached the Sikasso wholesaler, who agreed to provide approximately 25,000 USD of input credit to the union for the purchase of fertilizer through a notarized resource contract. Due to difficulties collecting the final 2 MT of in-kind reimbursements at the end of the loan period, the wholesaler opted not to repeat the transaction in 2014-15.

Case MS2. Since its establishment in 2007, the 130-member Segou marketing cooperative has received financial and technical assistance from multiple development projects. Today it annually finances the bulk purchase of subsidized fertilizer for its members and markets the in-kind reimbursements (along with any other farmer surplus). Two of the cooperative's clients are two Bamako-based SME cereal processors, each founded about 20 years ago by a Malian female

⁵⁷ Since the end of the USAID project, the Sikasso FO reports attempting to initiate the creation of a union with 10 other USAID-supported FOs in order to make bulk input purchases and bulk cereals sales, but has not yet been able to garner sufficient interest from other FOs. A USAID follow-on project is continuing to work with this Sikasso marketing cooperative and others.

⁵⁸ Trade capacity includes 2,400 MT of warehouse space, 5 trucks, and a 200,000 USD line of credit from BNDA.

entrepreneur. SME-I specializes in processed cereal (maize, millet, and sorghum) products and in 2015-16 began operations in a new factory complex (at a total cost of approximately 600,000 USD, about half of which was self-financed), which should triple production capacity to better meet its high local demand (70-80% of which is based in Bamako). SME-II produces a millet and yoghurt-based food in a factory (valued at more than 400,000 USD⁵⁹), in addition to other dairy and fruit juice products, and is progressively expanding into export niche markets.⁶⁰ Around 2008, both firms began building a supply network with the Segou marketing cooperative. Their primary motivation was production costs and risks resulting from high levels of impurities and heterogeneity of cereals purchased from spot markets.⁶¹ The processors originally used written marketing contracts, although SME-I states that agreements are now tacit and verbal. In the months around harvest (beginning in August), the cooperative contacts the processors to exchange expected supply and demand information; later, each processor places one to three orders for delivery over the course of the commercial season. SME-I orders approximately 80 MT of millet and sorghum each year.⁶²

In 2010-11 and 2011-12 the Segou marketing cooperative also sold 50-75T to WFP through a marketing contract (signed in March-August). Perceiving greater opportunities in bulk markets, the FO created a local union with seventeen other village cooperatives. The union has quickly come to serve a marketing function. In the 2013/14 and 2014/15 marketing seasons, it sold 525 MT (millet and sorghum) and 350 MT (millet), respectively, to WFP (through marketing

⁵⁹ 400,000 USD represents a BNDA commercial loan amount. An additional 120,000 USD was paid in interest.

⁶⁰ SME II's products are currently FDA-certified, and its clients include Air France.

⁶¹ SME I reports incurring up to 40% weight losses from impurities in some spot purchases.

⁶² SME I also reports occasionally purchasing 20 MT of millet from a Segou wholesaler who cleans the grains using an electric blower provided by a USAID project.

contracts).⁶³ During the 2014/15 marketing season the union also obtained a 500T forward contract from OPAM. Prior to these contracts, the Union took out a 110,000 USD loan from an MFO, guaranteed by its stocks. The Segou cooperative reports that all buyers have the same high quality standards⁶⁴ and use very similar price formulas based on the Bamako wholesale price, plus transport and handling, and a 30 to 40 USD/MT mark-up for good quality. Current constraints include limited local warehousing capacity and access to a commercial line of credit.

6.4. Regional farmer cooperatives

According to Malian law, a union is the coop structure in the second-degree, meaning that it federates multiple local coops into a larger coop structure. With reference to the HC framework categories, a union usually plays the role of a marketing cooperative, only at a larger scale and level of complexity than village marketing cooperatives. Accordingly, the cereal farmer unions described in the below cases take on a common set of activities that are oriented around the production and commercialization of cereals. First, the unions described below annually help individual farmer members to plan their expected production, food storage, and commercial activities. After aggregating input needs, it negotiates a large input loan, often made possible through a guarantee fund originally put in place by a donor; and makes bulk purchases of MG-subsidized fertilizer. Often, certified seed is produced and sold on credit within the union and cash provided to members to cover hired labor costs. A union has dedicated field staff that provide training to and monitoring of farmers, often with a simple traceability system that links each sack of grain to its producer. The union may additionally serve as a platform for other

⁶³ Delivery periods range from two weeks to two months on different contracts.

⁶⁴ Processors additionally insist on the Torono variety of millet, which is particularly conducive to milling.

services such as equipment loans or rental, crop insurance, literacy training, women's income-generating programs, and food security safety net mechanisms.

The unions in these cases typically obtain commercial volumes from their members through three mechanisms, which can be understood as marketing pathway options for these farmers. First, farmers reimburse input loans in kind at harvest at a previously agreed price. Second, farmers can commit to marketing any additional volume through a warehouse receipts system, in which it again cedes the commodities to the union after harvest at a previously agreed purchase price. Third, farmers may make direct impromptu spot sales to the union based on the current market price. The union finances commodity purchases, pays off the input loan, and finances subsequent storage and marketing activities through a line of commercial credit that it takes out towards the end of the calendar year. Any profits remaining at the end of the marketing process (after loan reimbursement, marketing costs, and other union costs or savings have been subtracted out) are returned as a dividend to farmers based on quantities that each marketed through the union. As with village cooperatives, the initiation and initial sustainability of these activities usually requires considerable external assistance.

Cases MS3, R3. Segou union was created with Canadian assistance following liberalization of Mali's cereal markets in the early 1990s. It is today Mali's largest FO in terms of total marketed cereals, and organizes 4,760 farmers (2,960 for rice, 1,800 for coarse grains) from 119 village cooperatives (74 for rice, 45 for coarse grains) across the Segou region. Its primary mission is the production and marketing of surplus cereals, and it markets up to 3,400 MT of rice and 800 MT of coarse grains (most of which is millet/sorghum) each year. The union's primary coarse grain buyers are Malian wholesalers (via verbal spot purchases), although WFP purchased 510 MT in 2013-14 (via written marketing contract). The most important rice grain buyer is

WFP (via written marketing contract), followed by OPAM (written marketing contract), and Malian wholesalers (via verbal spot purchases). Each year the union takes out approximately 2.8 million USD in input and commercial credit (for subsidized fertilizer, certified seeds, and labor) to finance members' production and the union's marketing activities.⁶⁵ Fifteen full-time staff help execute the union's commercial mission, in addition to an owned warehousing complex of 5,400 MT capacity. It also offers a program in which members can access production and processing equipment through medium-term loan mechanisms.

The union's primary challenge is high commercial costs tied to bank interest, logistics (especially in the coarse-grain production zone), the costs associated with collateral management agreements with the bank, and losses due to non-reimbursements.⁶⁶ Specifically for rice, the union depends heavily on institutional markets and otherwise has difficulties liquidating its rice volumes in a timely manner and at a price that allows the union to cover costs and return a dividend to its members.⁶⁷ The union identifies cheap rice imports and food aid as the source of its rice marketing difficulties, while acknowledging also that its rice sometimes suffers from quality problems (discoloration and a high level of breakage). The union is seeking the funding for a semi-industrial rice mill to help redress these problems. While millet has been the only crop

⁶⁵ Most of which is from BNDA and backed by an interest-accruing guarantee fund worth more than 800,000 USD, originally put in place by a Canadian donor. The BNDA loan agent managing the union's account states that the bank effectively considers the FO as a wholesale trader, and so does not require marketing contracts before according a line of commercial credit.

⁶⁶ The Segou union estimates that 50-200 members each year are delinquent in their reimbursements, either as a result of strategic default or uncontrolled events such as drought and flooding.

⁶⁷ This recurring issue was accentuated during the 2014-15 commercial season when, after eleven months of warehousing and the accrual of approximately 100,000 USD in bank interest, rice grains were finally sold at a 30 USD/MT loss, which largely contributed to a total loss of 90,000 USD loss that year. The late sale further retarded input loans for the 2015-16 season. In 2012-13, the union also suffered a commercial loss of approximately 60,000 USD due to loss of cereals and/or cereals weight, incomplete dues payments, 65 MT of unsold rice stock, and non-reimbursements.

to turn a profit in the last two years, farmers' marketed volumes of the coarse grains have decreased steadily in recent years.

Cases M/S4, M4. Koulikoro union was created in 2006 with Dutch support. The original motivation was to encourage the production and marketing of rain-fed cereals as an alternative to cotton farming, which was at the time troubled by recurring institutional problems.⁶⁸ The union is composed of 2,000 members organized into 7 villages, and is focused on the commercialization of sorghum (up to 800 MT/year), followed by maize (up to 300 MT/year) and millet (up to 120 MT/year).⁶⁹ The primary maize buyer is an industrial broiler and feed processor (up to 100T per year through verbal marketing contracts made around November to December). Since 2009-10 its primary millet and sorghum buyer is WFP (up to 800T per year through written marketing contracts), followed by two Malian wholesalers (verbal spot). The union sells at Bamako wholesale prices (WFP adds a 40 USD/MT premium to these prices) and delivers to buyers' warehouses from its own collective warehouses (1,300 MT capacity) using its own 40T truck and rented ones when necessary. In 2014-15 the union acquired an air blower and generator to clean its grains upon request by a buyer, which they estimate will add a 20 USD/MT markup to their prices.

In addition to cereal sales, the union also produces multiple certified seed varieties (100 MT in 2013-14, including 80 MT of sorghum) to increase members' access to locally adapted seeds and to diversify revenues. It additionally offers to its farmers a cereal bank mechanism, which reportedly assisted 100 households with their food security needs during a 2011-12 drought. Beginning in 2014-15, the union expanded its line of input and commercial credit from 200,000

⁶⁸ Despite this history, at least some of the farmer households have since taken up cotton production again.

⁶⁹ Figures are marketed volumes in 2013-14, and are the highest in the 2012-13 and 2013-14 period. While sorghum is the primary crop marketed, maize is the primary consumed crop.

USD to 400,000 USD by switching from BNDA to an international private lender.⁷⁰ Since 2014-15 it is also piloting an equipment financing mechanism and the adoption of a crop insurance program. The union's strategic plan aims for its expansion to a 15-cooperative base by 2019. While it reports having no major problems with member reimbursements, it cites several major contract breaches since 2013 by two buyers.⁷¹

Case M5. Sikasso union-II reportedly regroups 28,000 farmers from 153 village FOs from the Bougouni, Yanfolila, and Kolendeba zones of Sikasso. Six paid staff help to execute its commercial mission, which focuses on maize. Most sales are to actors aligned with livestock feed markets (including the industrial rice/maize processor since 2008-09), and are often made with other large FOs, as part of one of two bargaining blocs that the union has initiated. In 2013-14 it reports to have sold more than 1,000 MT as part of these aggregated sales. Transactions include written spot and marketing contracts. The union president states that their pricing strategy takes into account a comprehensive range of production and commercial prices, resulting in sales prices that are usually at least 20% above the reference market price. Commercial activities are financed by a 500,000 USD line of credit from Bank of Africa, supported by a guarantee from a French development partner. A Malian input and cereals trader provides certified seeds through resource contracts. The union also provides drought insurance to its members⁷² and a farmer pension system. According to the union's leadership, its biggest challenge is a perceived vulnerability to external actors who "take advantage" of the needs of the

⁷⁰ BNDA required a guarantee and a third-party warehousing and collateral management arrangement.

⁷¹ One breach was by an industrial maize processor that reneged on the purchase of 500 MT of maize, and another by a major local commercial seed company that reneged on the purchase of 90 MT of certified seed.

⁷² In partnership with Alliance for a Green Revolution in Africa and Planete Garantie. This policy reportedly paid out to the union 100,000 USD in 2014-15, and 4,000 USD in 2013-14. It is worth noting that myAgro also considered this policy, but found its quoted premiums (30-35% of input costs) too expensive, which may be due to the insurance program's high field visit-based monitoring costs. The Koulikoro union also took out a policy for 2014-15, and later reported dissatisfaction with the program, specifying that it reported erratic rainfall that year, but did not receive field visits or a pay-out.

farmers. This perception is fueled by multiple experiences since 2012 in which the union was reportedly defrauded by false partnerships (at a total estimated loss of 500,000 USD)⁷³ and a 2014 dispute with the industrial rice/maize processor, in which the union accuses the firm of renegeing on the purchase of 360 MT of a 1,000 MT maize contract. It also struggles with the related issues of member non-reimbursement and side selling.

6.5. Service provider marketing cooperatives

The research documented a number of FOs that facilitated members' access to output markets, but which were originally created for other purposes, namely the provision of training, education, or credit services. Over time, these organizations developed a pattern of ad hoc interventions in output markets on behalf of their members. These were motivated by a perceived need by their members for such services, usually occasioned by market opportunities and sometimes encouraged by external project support. Although these interventions typically evolved into de facto marketing strategies, these organizations do not directly access a commercial line of credit for their members nor do most of them possess logistical or commercial assets. In this sense, their role in output markets remains largely that of a large bargaining association. However, because of these FOs' provision of inputs/services (which technically implies a degree of backwards vertical integration) and because of their involved facilitation of large, repeated sales, this study classifies these FOs as a type of marketing cooperative.

⁷³ For example, according to union leadership, one such case in 2013-14 involved a Malian MFO that agreed to commercialize 300T of maize; however, following maize collection, the MFO never made payment. Three other separate cases in 2012-13 involved foreigners promising either financing and exporting/marketing assistance. However, after collecting a preliminary fee/co-investment from the union, each of these individuals ostensibly vanished. Note that none of these reports are yet confirmed by non-union sources.

Case M6. Sikasso union-II was originally created as a rural development association focused on promoting local language literacy and education among 15 village associations. However, in 2011 it began to also provide assistance in production planning and technical assistance, access to fertilizer (chemical as well as organic), and marketing. The union sells up to 980 MT of maize per year and has transacted maize with multiple wholesalers and the industrial rice/maize processor through verbal and written spot and marketing purchases, sometimes in collaboration with Sikasso union I. It does not currently have a stable financing partner. Among its assets, the union has fifteen paid staff and a network of village warehouses.

Case R4. ON farmers' credit union is a farmer-owned and managed MFO that specializes in rice input credit, in addition to offering medium-term equipment and other agricultural loans in the ON. Its 54,000 member base is distributed among 92 village agencies throughout each of the six zones of the ON. It reports 3.2 million USD currently on loan, 1.6 million USD in current savings, and reimbursement rates of 95%. The union states that it also frequently facilitates bulk sales opportunities on behalf of its members in order to help assure that loans are reimbursed.⁷⁴ Typically, after learning of a market opportunity, the union will play a negotiating and information-sharing role among its members, and sometimes enter directly into contract on behalf of its farmers. Buyers usually organize and pay for transportation. Since 2009-10 the union facilitates one to two sales each year, primarily of rice paddy (up to 1,100 MT per year) to the industrial rice/maize processor and other industrial rice processors through verbal spot purchases or marketing contracts, and occasionally milled rice (up to 200 MT per year) to OPAM through written marketing contracts. In 2015-16, the union is introducing a new

⁷⁴ In addition to benefits associated with bulk purchases, the union claims that buyers also benefit because farmers' association with it signal that they can be trusted as suppliers.

warehouse receipts system financing mechanism to enhance its members' marketing activities.⁷⁵ Despite these efforts, the union reports that its major challenge is non-reimbursements.

Case R5. ON Federation was launched in 1995 with French funding and consists of six service centers that offer five lines of fee-based services and management tools⁷⁶ to approximately 400 village bargaining associations and marketing cooperatives and to separate 15,000 family farms.⁷⁷ The package of services to village FOs includes technical support in production and input credit applications and management. As commercialization is not at the heart of the federation's formal strategy, it is fundamentally the village FOs that are responsible to obtain loans and to market rice. However, in practice the services centers and/or the central federation office commonly intervene to support FOs in loan applications, make bulk input purchases, search for and negotiate output markets, and aggregate commercial volumes for buyers. As the legal representative of its constituents, the federation can furthermore enter into contracts on behalf of its members. What effectively emerges is multiple levels of marketing: farmers individually sell small quantities of rice grain throughout the year as they have cash needs; cooperatives tend to market their members' reimbursed rice and paddy to wholesalers; service centers occasionally negotiate paddy sales with wholesalers and rice mills; while the federation occasionally obtains paddy or milled rice contracts with industrial mills or OPAM.

⁷⁵ According to the union, the warehouse receipts system is being supported by an Italian NGO and will be institutionally integrated into existing village organization structures by incorporating new rules into existing statutes and bylaws. The process is as follows: (1) before harvest, members commit to stocking a certain amount in the system; (2) the organization transmits (via the village agency) the requested loan amount to the central office; (3) agencies finance up to 90% of value of the FO stock, based on the local market price of rice (at 15% over 6 months); (4) organizations can use cash for any purposes including, for example, to pay water user fees; (5) organizations sell whenever they want to reimburse within 6 months.

⁷⁶ These tools are for 1) rice farm management; 2) farmer organization, which includes credit management and contracting; 3) women's' income generation; 4) general family farm management; and 5) other training topics such as local language literacy.

⁷⁷ The service centers represent the cooperatives in the second degree, essentially as a union of the village FOs, while the federation regroups the service centers.

Marketing is also part of the federation development plan. The federation cooperatives reports that it currently sells up to 1,000 MT of certified seeds. In 2011, the Syngenta Foundation for Sustainable Development equipped one service center with a semi-industrial milling complex (valued at approximately 50,000 USD, according to the federation), including equipment to hull, clean, blanch, and sort rice. However, several issues have challenged this commercial direction of the federation, including a slow restart of activities following a suspension from late 2011 to early 2014 due to instability and insecurity in the country; rice mill break; lack of commercial credit (throughput is currently limited to input loan repayments); difficulties in members reimbursing input credit on time; and difficulties meeting the quality and quantity specifications of sales contracts.⁷⁸

6.6. Summary and discussion of governance structures

Table six provides a summary of the case actors and governance structures. The case studies document a diversity of HC structures that are used to organize farmers as commercial actors in higher-revenue cereal market segments. Within the individual farmer category alone, firms or external service providers may organize otherwise autonomous farmers. There is also an important diversity within what may be considered the marketing cooperative category. As discussed, this type of FO can first of all vary in terms of size and scale: small marketing cooperatives operate at the village level and market as little as 10-20 MT per year, while unions and service provider FOs operate at a higher geographic level and can market more than 1,000 MT per year. Second, while all of the marketing cooperatives provide marketing services in

⁷⁸ In 2011 the Federation was only able to deliver approximately 1,200 MT on a 5,000 MT paddy contract with the industrial rice/maize processor, and leadership admits to having quality problems with the delivered paddy. In 2014 leadership expressed pessimism at being able to fulfill an open 1,500 MT rice grain contract with OPAM, of which only 300 MT had been delivered on time by Diabaly.

some form, service provider FOs have focused on other primary services (training, input, or financial). While empirically these distinctions seem important, this analysis classifies these FOs as marketing cooperatives in order to conform to the HC framework.

Table 6: Horizontal and vertical governance structures used in Malian cereal cases

ACTUAL Horizontal Structure	Case	ACTUAL Vertical Structure	Buyers
INDIVIDUAL FARMERS	M1	RELATIONSHIP	SME feed processor
	M2	MARKETING	Various SME and industrial maize processors
Village BARGAINING ASSOCIATIONS	R1	RESOURCE & RELATIONSHIP	SME rice mill
	R2	MARKETING & RESOURCE	Wholesaler
Village MARKETING COOPERATIVES	MS1	MARKETING	Wholesaler
	M3	MARKETING	Wholesaler
	MS2	MARKETING	SME food processor, WFP
Regional MARKETING COOPERATIVES	MS3	SPOT & MARKETING	Wholesalers, WFP
	R3	SPOT & MARKETING	WFP, OPAM, wholesalers
	MS4	MARKETING	WFP, wholesalers
	M4	SPOT & MARKETING	Various poultry feed processors, wholesalers
	M5	SPOT & MARKETING	Industrial feed processors
Service Provider MARKETING COOPERATIVES	M6	SPOT & MARKETING	Industrial feed processors, wholesalers
	R4	MARKETING	OPAM, industrial feed processors
	R5	MARKETING	OPAM, industrial feed processors

The case studies demonstrate some range of VC structures, with marketing contracts as the dominant VC structure used across commodities and by all buyers. However, within the marketing contracts category there is also an important diversity that is used, with variation in the level of specification, in form (ranging from verbal/tacit to written agreements), and in timing (the period between agreement and delivery commonly ranges from two weeks to several

months). What all of these marketing contracts have in common is that they involve some advance agreement that facilitates planning and coordination (even if over a two week period), and include some level of specification (usually at least with respect to quantity, although other details may be tacit). Some spot purchases were reported, usually between large maize marketing cooperatives and wholesalers. Several buyers (rice and maize SME processors and a wholesaler) use resource contracts, in which the majority of transacted volumes are limited to in-kind reimbursements.

There was some difficulty in distinguishing between repeated marketing contracts and resource contracts on one hand, and alliances on the other. This analytical task is further complicated by Mali's strong socially-embedded trading culture, in which social ties or cultural values may effectively forge a trading relationship into a relationship alliance, while repeated verbal or written contracts are the primary observable mechanism being used.⁷⁹ However, years of repeated transactions do not also automatically add up to a relational alliance, as highlighted by reported cases of contract breaching between two experienced partners.

Another insight is that many VC and HC structures appear to have an evolutionary character. For multiple cases it is a somewhat difficult task to categorize the HC structures cleanly. Over time, individual farmers organized by firms and external service providers may demonstrate a desire to consolidate and take ownership of what is initially an exogenous association. Some non-federated village marketing cooperatives aspire to expand their size and marketing scale through federation with other cooperatives. Some large FOs originally created to provide

⁷⁹ For example, a few of the VC structures could possibly be considered a relational or equity alliance by merit of a number of co-investments that have been made, most of them soft, but some more material. These include time invested to improve product quality, the provision of technical assistance, the sharing of information, deferments on late reimbursements or forgiveness of breached contracts due to uncontrollable events, the guaranteeing of bank loans for the trading partner, and even the sub-leasing of land at no cost.

services with time adopt bargaining functions on behalf of their members. Even the leadership of the large FOs commonly express a desire to grow their organizations. In sum, most HC structures demonstrate a movement towards greater scale and structural complexity, with external project assistance seeming to be the critical factor enabling conversions from one structural iteration to the next. On the other hand, VC structures demonstrate a tendency to become less formal and controlling over time. The most common sign of this is cases of written contracts evolving over time into repeated verbal agreements.⁸⁰

A final observation from this section is that virtually all smallholder cereal farmers in these cases have multiple pathways to market their grains, and interviews with individual farmers suggest that most take advantage of at least two pathways. In addition to local spot markets, all case farmers are involved in some alternative coordination system through which they market some volumes. Usually marketing through these governance structures centers on reimbursements for farm inputs, especially fertilizer but often also seed and cash. Several interviewed farmers even acknowledged belonging to multiple marketing organizations. Farmers belonging to federated FOs often have the opportunity to market either through their village FO or through the larger FO. Even within a given HC or VC structure, farmers may take advantage of various pathways to market. The chief example of this is the cooperative unions, which typically offer three pathways to market: reimbursements, other planned sales, and spontaneous

⁸⁰ Where verbal and tacit contracts are used in lieu of written contracts, interviews suggest that they usually include at least the quality, quantity, price, delivery and payment aspects, although presumably with less stipulated detail. Interviews suggest that such non-written contracts are usually made on a basis of previous transactions between the two parties, in which case many of the contract details are presumably already understood without the need for explicit re-specification each time. In a few cases, two parties first began doing business using written contracts (sometimes by requirement or recommendation of a project), but later decided that these were no longer necessary, and henceforth used verbal or tacit contracts. Reasons cited for not using written contracts centered on the perceptions that they demand unnecessary protocol (increased time and expense), that they were unnecessary or culturally inappropriate, or that they do little good in terms of enforcement.

spot sales. Hence, it is important not to assume that the farmers in each case are limited to—or even that they chiefly utilize—the HC structure highlighted for that case. Likewise, buyers commonly use more than one form of VC, oftentimes diversifying a resource or longer-term marketing contract with spot purchases or shorter-termed marketing contracts.

7. FRAMEWORK RESULTS AND DISCUSSION

Following the empirical approach set out in Chapter 3, analysis using the coordination framework is conducted as follows. For each of the fifteen cases, the transaction characteristic scores (from Chapter 5) are used to score HC and VC governance structures within the framework. The HC and VC governance structure receiving the largest scores are predicted to dominate in that case. Table seven summarizes the results from this analysis, comparing the predicted VC and HC structures to those that are actually used in the cases.

Table 7: Results from application of the framework to Malian cereal cases

ACTUAL Horizontal Structure	PREDICTED Horizontal Structure	Case	ACTUAL Vertical Structure	PREDICTED Vertical Structure
INDIVIDUAL FARMERS	Bargaining	M1	RELATIONSHIP	Relationship
	Bargaining	M2	MARKETING	Marketing
Village BARGAINING ASSOCIATIONS	Marketing	R1	RESOURCE & RELATIONSHIP	Relationship
	Marketing	R2	MARKETING & RESOURCE	Resource
Village MARKETING COOPERATIVES	Marketing	M3	MARKETING	Resource
	Marketing	MS1	MARKETING	Resource
	Marketing	MS2	MARKETING	Resource
Regional MARKETING COOPERATIVES	Marketing	MS3	SPOT & MARKETING	Resource
	Marketing	R3	SPOT & MARKETING	Resource
	Marketing	MS4	MARKETING	Resource
	Marketing	M4	SPOT & MARKETING	Marketing
	Marketing	M5	SPOT & MARKETING	Marketing
Service Provider MARKETING COOPERATIVES	Marketing	M6	SPOT & MARKETING	Marketing
	Marketing	R4	MARKETING	Resource
	Marketing	R5	MARKETING	Resource

7.1. Do transaction characteristics predict horizontal and vertical structure choice?

Results suggest that the coordination framework is mostly accurate in predicting HC governance structures. Of the fifteen cases, the framework correctly predicts the horizontal governance structure that is actually used for 11 cases (73% of the total). Three of the remaining predictions (20%) are incorrect, and one (7%) is partly correct. In contrast, most (8 of 15, or 53%) of the predictions generated by the VC framework are incorrect. The VC predictions are only correct for 2 (13%) of the cases, and are partly correct for 5 (33%) of the cases. Thus, on a first-level analysis, it appears that the case study data generally supports hypothesis one: the transaction characteristics of asset specificity, frequency, uncertainty, and externalities strongly influence farmer's horizontal governance structure choice. On the other hand, the case study data does not appear to support hypothesis two, which states that buyers' governance structure is influenced by these same factors.

However, the contrasting performance of the coordination framework, with respect to its prediction of HC and VC structures, demonstrates an interesting overall pattern that may help to explain results. For each case, the framework generates correct predictions for either the vertical or horizontal dimension, and is incorrect (or, at best, partially correct) for the other dimension. Furthermore, the framework's prediction is generally correct for the particular dimension that leads coordination by undertaking certain transaction cost reducing activities. These key activities are the organization of farmers into production groups, the facilitation or direct provision of input credit and inputs (especially fertilizer), and the aggregation and sale (or purchase) of farmers' marketed surpluses.

For example, for the eleven cases (R3 to R5, M3 to M6, and all MS cases) in which the framework correctly predicts the horizontal structure, all employ the strongest form of horizontal

coordination observed among the cereal case studies: marketing cooperatives. For each of these eleven cases, the framework essentially over-predicts the vertical governance structure, meaning that it predicts that the buyer would chose to impose more control than what is actually implemented in practice. In particular, in eight cases the framework predicts that the buyer would provide resources when in reality the marketing cooperative plays this role. However, for most cases, the buyer does provide output market information (in terms of quantity, quality, timing, pricing) to farmers.

In three of the remaining cases (M1, M2, R1), the framework over-predicts the horizontal governance structure, predicting that farmers would organize in bargaining associations or marketing cooperatives when in fact these cases feature no or minimal farmer-initiated organization. Instead, an external actor provides essential resources, marketing services, and aggregation services to farmers through a resource contract and/or a relational alliance that employs resource contracts. An SME processor carries out these activities in M1 and R1, and a service provider enterprise in M2.

Finally, recall that R2 featured two types of governance structure combinations: the rice wholesaler used marketing contracts with village marketing cooperatives, and also resource contracts with village bargaining associations. Consistent with the above observations from the other cases, for R2 the framework is correct on the horizontal dimension of the governance structure combination featuring the stronger of the FOs, while the framework is incorrect for the vertical dimension. However, the framework was incorrect on the horizontal structures for the cases involving the weaker FO, while it was correct for vertical dimension because this case involved the stronger of the vertical structures.

This pattern suggests that vertical and horizontal governance structures are to a certain extent substitutes, in that both can address transaction cost problems that are relevant to both buyers and farmers. If true, then the vertical and horizontal governance choice is partially inter-dependent: when buyers or farmers consider an appropriate governance structure to coordinate a transaction, each party's analysis of the transaction actually accounts for transaction costs *in addition* to other transaction cost-reducing governance structures that are present. Therefore, where additional governance structures are present, the framework should downgrade its assessment of transaction costs accordingly. Otherwise, it will predict a structures that employ more control than is actually required by the situation.

Another factor that may partly explain the discrepancy between predicted and actual governance structures is the omission of social incentives⁸¹ from the framework. Bijman (2008) explained that the social incentives to honor a contract may include bilateral relationship-based incentives (involving empathy, identification, and affection) or multilateral community-based incentives (involving values, norms, and customs). Multiple authors have charged that social incentives are under-represented or ignored in TCE, but important because their presence can help to produce stable contract conditions by reducing opportunism, and thus possibly serve as a substitute for more formal forms of coordination (Grover and Malhotra, 2003, Zhang and Aramyan, 2009, Kirsten and Sartorius, 2007).⁸²

In summary, the analysis of the Mali cereal case study results only support the hypothesis that transaction characteristics play a significant role in influencing HC governance structure

⁸¹ Williamson (2000) conceptualizes these and other factors as “embeddedness,” a higher level of institutions that include customs, traditions, norms, religion, and informal institutions.

⁸² However, integrating social incentives into the framework may not be an easy task. In their TCE analysis of value chain cases of South African sugar and timber, Sartorius and Kirsten (2007) attempt to describe and integrate the presence of trust into their vertical coordination framework, but can only conclude that “although the presence of trust can influence the contract characteristics of supply arrangements, it may not be significant because of other factors in a developing country context” (Sartorius and Kirsten, 2007).

choice. However, a closer examination of the combined VC-HC results strongly suggests that transaction characteristics still drive both choices, but that the presence of other governance structures is another significant transaction characteristic.

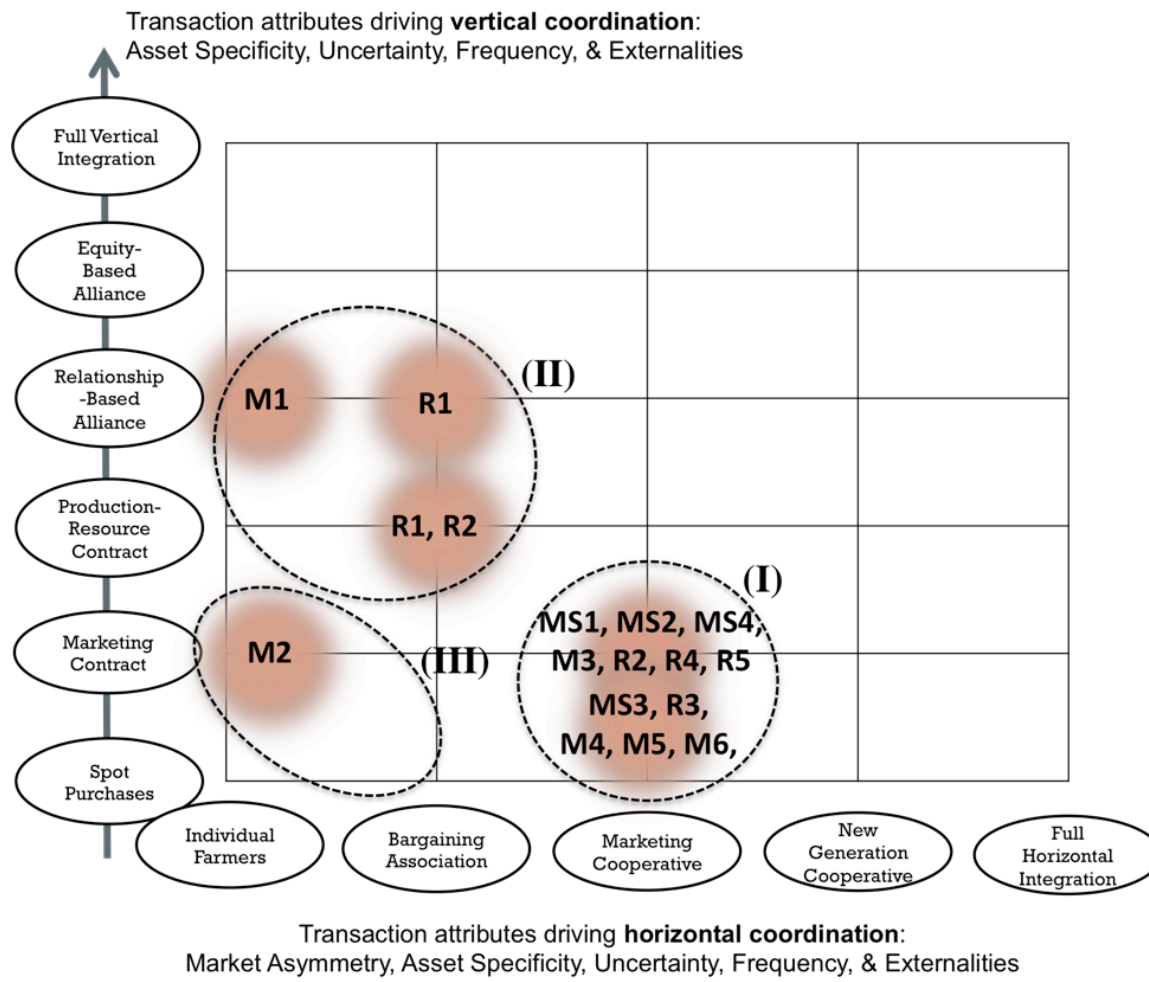
7.2. Is there a dominant economic coordination model for Malian cereals?

The pairwise patterns (or models) of coordination found in the Malian cereal cases can be grouped into three categories, where the actor taking the lead-role of coordination distinguishes each category. In this typology, taking a lead in coordination refers specifically to the condition of bearing the largest share of the governance costs of coordination. The three models of coordination observed in Malian cereals are farmer-led coordination (through marketing cooperatives), buyer-led coordination (through resource contracts and possibly also relationship alliances), and service provider-led models (through mediating arrangements with both farmers and buyers). This typology corresponds (and providing TCE-based theoretical grounding) to the three-part classification of smallholder organization proposed by Vorley, et al. (2009) and Shepherd (2007).⁸³

This coordination typology is visually represented in figure four, which is adapted from Poulton and Lyne (2009). It represents how vertical and horizontal coordination jointly operate to achieve total economic coordination in a given value chain. The vertical and horizontal governance structure choices of each of the Mali cereal cases have been plotted along the y and x axes, respectively. The three encircled clusters represent the three types of coordination models found in the case studies: farmer led (I), buyer-led (II), and service provider-led (III).

⁸³ It is also reminiscent of the marketing chain “drivers” and captains from the Global Commodity Chain literature (e.g. Gibbon, 2001).

Figure 4: Economic coordination models in Malian cereals



Given the predominance of the marketing cooperative-marketing contract combination in at least two-thirds of the cases, the Mali case study data suggests that the farmer-led coordination model may be the dominant one for these case studies. If this is the trend, how does one explain the outlying cases M1, M2, R1, and R2⁸⁴? It was noted in Chapter 6 that horizontal coordination appeared to demonstrate a movement over time from low to higher forms of control, and vertical coordination from higher to lower forms of control. If such an evolution describes the farmers in

⁸⁴ R2 is plotted twice given that it features two governance structure pairs.

cases M1, M2, R1, and R2, then farmers and buyers may eventually move towards the structures predicted by the HC and VC framework. The M1 and M2 interviews seem to support this conjecture, as the buyers in these cases reported dissatisfaction with the current level of farmer-organization because of the costs or difficulties in communicating information, or delivering inputs to these farmers. M1 farmers also reported an interest in creating a bargaining association in order to reduce these difficulties and to improve access to financial services. As Peterson, et al. (2001) pointed out, actors may opt for theoretically sub-optimal structures because they do not have the knowledge or capabilities to adopt the optimal structure. The nature and sources of transaction costs may also change, either in reality or as they are perceived by the actors, thus again prompting the possibility of change over time (Kirsten and Sartorius, Karaan, Dorward 2009). Thus, the VC and HC choice process is likely dynamic, with farmers and firms making adjustments over time as the transaction costs of a given exchange situation also change (Peterson et al., 2001).

7.3. Is there a sustainable economic coordination model for Malian cereals?

Is the marketing cooperative-marketing contract model also the most sustainable for linking Malian cereal farmers to higher-revenue cereal markets? Conclusively answering this question would require methodical analysis of the performance of each model, which is beyond the scope of this thesis; however, the case study data can provide some preliminary insights on this important issue.

It has already been noted that MG policy places increasing responsibility on farmer organizations for the provision of production and marketing-related services. NGOs and private sector actors also demonstrate increasing engagement of FOs as primary partners in their program and business strategies. The ability of FOs to manage such relationships and to

perennialize services to their members requires structural elements (such as dedicated central management and operational budgets) that bargaining associations do not have. The effective fulfillment of these responsibilities by FOs may also require a level of control and investment-pooling that surpasses that which bargaining associations can facilitate. Thus, where extension, credit, marketing, and other forms of assistance are essential to coordinate farmers with market segments (and where these services are not already accessible to individual farmers by other public or private actors), marketing cooperatives appear essential for market access. The Mali data and framework both suggest that the appropriate VC complement to marketing cooperatives is the marketing contract, which provides farmers with a remunerative market and essential information for satisfying that market. As discussed, as farmers and buyers build a base of trust and experience trading with one another over time, the form and terms of marketing contracts may increase in simplicity.

Sensitivity analyses also suggest that the marketing cooperative-marketing contract combination may be a sustainable coordination model as the enabling environment for cereal markets improve. Table 11 (see Appendix E) presents the coordination framework's predictions of HC structures in a scenario where uncertainties or externalities are reduced, such as through government policy impacts. Marketing cooperatives are the dominant HC structure under a scenario of reduced externalities, and are included in the range of expected HC structures for most rice and millet/sorghum cases under the reduced uncertainties scenario.⁸⁵

Given the observed variety of marketing cooperatives, the case studies may also flag structural features that are important to the sustainability question of these FOs. First,

⁸⁵ As already explained, the framework would have to be enhanced to include HC structure as an independent variable to VC choice in order to use the framework to accurately predict VC structure under these different transaction characteristic scenarios.

membership size and heterogeneity appear to matter. On one hand, village-level marketing cooperatives may not be large enough to pool sufficient equity and aggregate sufficient volumes for effective coordination with many partners and buyers. While several cases (e.g., M1, M3, MS2) feature village-level FOs that appear to match well with SME processors and certain wholesalers in terms of scale, all of these FOs demonstrate movement towards greater size through federation in order to access better services and more markets. On the other hand, very large unions (as in cases R3, MS3, M5, R4, and R5) face difficulties managing the large heterogeneity of their membership base, manifested in problems such as high operational costs, members' side-selling, and inconsistent quality. The best possible size may ultimately be the medium-sized union (as featured in cases M4, MS2, MS4) consisting of village cooperatives in a consolidated geographic zone.

Second, the Mali cases also clearly demonstrate the absolute necessity of external assistance—both financial and technical—to marketing cooperatives in order to build their capacity to eventually function independently and effectively. Required assistance must last well-beyond the going project cycle of three to five years, with the exact length varying according to each case. However, assistance should undoubtedly evolve and maintain flexibility over time. Assistance should also be very cautious about externalizing the operational costs of marketing cooperatives or building market linkage systems that rely on temporary project elements.

8. CONCLUSION

8.1. Summary

Firms, farmers, and a variety of development actors are taking an increased interest in governance structures as an essential element for coordinating smallholder farmers with emerging and expanding market segments. However, theory and practice demonstrates that there is an important variety of VC and HC governance structures, and of combinations thereof. The mixed track record of many value chain governance experiments underlines that selection of the most appropriate governance structures is not always an obvious task (Prowse, 2012).

This thesis has sought to contribute to a better understanding of the governance structures that can link smallholder farmers to higher revenue market segments and of the transaction-level characteristics that determine the relative cost-effectiveness of one structure over the others. In particular, it expands current coordination frameworks to include two issues that are especially important in the African agricultural context: externalities and resource provision. It furthermore develops a horizontal dimension to the coordination framework to explicitly represent the farmers' HC structure choice as a function of transaction cost characteristics, thereby highlighting horizontal coordination as a dimension of African agricultural value chain governance that is as important as vertical coordination.

This study empirically tested the VC and HC frameworks using fifteen cereal case studies from Mali. These cases are representative of higher-revenue value chains in the Malian context. Analysis found that actors in these value chains face low to intermediate asset specificity, with processors having invested the most in relatively specific assets. Transaction frequency ranges from low to high, and largely depends on the varying asymmetric scale between buyers' throughput needs, and the small marketed volumes of cereal farmers. Most farmers and buyers

face moderate to high uncertainty due to cereal price volatility, uncertain supply, unpredictable policy interventions, and the unreliability of Mali's contract enforcement regime. The major externality present in Mali cereals is quality debasement, which is especially problematic for buyers.

The predominant governance structures used to coordinate cereal transactions in Mali are marketing cooperatives and marketing contracts, which are typically paired together. Comparisons between the actual and predicted governance structures provide the results for evaluating the performance of the HC and VC framework. Overall, the Mali cases provide some support to the HC dimension of the framework, but did not support the VC dimension. These results indicate that the four transaction cost characteristics of asset specificity, frequency, uncertainty, and externalities do not adequately explain vertical governance structure choices in Mali. However, further analysis of the results strongly suggests that there may be another transaction cost-related characteristic: namely, the presence of *other* transaction cost-reducing governance structures (e.g., in the majority of the Mali cereal cases: marketing contracts plus marketing cooperatives). Informal coordinating mechanisms (such as trust and reputation) and the element of time are two other factors that may improve the predictive power of the framework.

8.2. Implications for policy and agribusiness management

The results of this research have several implications for the inclusion of smallholder farmers in higher-revenue cereal market segments in Mali, and in similar contexts. First, chain actors for all commodities consistently reported several sources of cereal transaction costs—especially those related to uncertainty and externalities—that can be reduced by the Malian government and its development partners. The most promising contributions may involve the related objectives of

improving information systems and promoting appropriate risk management tools and instruments. For example, promoting the testing and scaling-up of drought, flood, and marketing insurance products, and guarantee and calamity funds, could incentivize increased investments by cereal actors' in productive assets, thus increasing supply, and reduce the risks of credit default thus increasing access to credit (Staatz, et. al., 2011).⁸⁶ Strengthening Mali's contract enforcement regime and establishing "credit bureaus" in rural areas to identify loan delinquents and to share this information between various financial institutions should also improve banks and MFOs' confidence to lend to a variety of agricultural actors (Staatz, et. al., 2011).⁸⁷ The Malian government should also seek to make its cereal policies as transparent as possible, so that actors can make fact-based business decisions. A recent example of this is OPAM's adoption in 2015 of a management code for its second (30,000T) procurement program, and the overall reformation of some of its buying and selling procedures. The effective enforcement of a single official system of cereals grades and standards that is economically relevant (i.e., that reflect what is actually rewarded by the market) should encourage private investment and enable the proliferation of cereal market segments that meet consumer demands while raising cereal actors' incomes.⁸⁸

⁸⁶ An example of such a scheme is a maize and cotton micro-insurance program being piloted by Allianz Insurance Company and Planet Guarantee, in partnership with other governmental, financial, and technical partners. It aims to protect farmers from capital losses incurred due to a drought event, as measured in soil moisture levels by a third party satellite imagery company.

⁸⁷ As an example, in years past the BNDA and a couple MFOs in the ON set up an institutional arrangement that facilitated the dialogue, information exchanges, and common rules which reportedly worked well (Staatz, et. al.). Unfortunately, one MFO co-founder of this arrangement reported in 2015 that this coordination is no longer functional due to the recent proliferation of other MFOs that aggressively compete for new clients.

⁸⁸ The MG has adopted grades and standards based on the CODEX Alimentarius; however, many of the standards therein many not be appropriate for the majority of conditions under which Malians live (USAID, 2012; Staatz, et. al., 2011). Furthermore, enforcement capacity is extremely limited: there is a confusing multiplicity of weak MG implementing agencies and of legal instruments instead of one coherent set of implementation procedures (Ibid.). There is also no legislation dealing with the traceability of agricultural products, the accreditation of laboratories, or the inspection of certification of agencies (USAID, 2012).

Until the above-described transaction situation improves, FOs supplying these market segments will likely continue to bear much of the burden of addressing the transaction cost problems. This observation is supported by the HC results and the current predominance of large marketing cooperatives in these market segments, and could be measured by the governance costs incurred by farmers in the fixed costs of creating and upgrading these relatively complex structures, combined with the variable costs of maintaining their activities. When targeting higher-revenue cereal markets, farmers should carefully analyze the HC-related governance costs required to access these segments, and confirm that prices can sustainably cover these costs. The Mali cases suggest that farmers may require external assistance in this preliminary cost-benefit analysis; followed by technical and financial assistance to build strong and cost-efficient cooperatives. The partnership history of the most evolved marketing cooperatives in Mali demonstrate that this assistance must be gradual and iterative, sustained for longer periods of time than what current project cycles afford, and should take care as to not promote cooperative structures that are too large or complex for what is appropriate to the targeted market and the current transaction cost situation.

As discussed, the VC framework cannot currently explain buyers' tendency to use marketing contracts as the preferred VC structure. However, given this actual predominance, and implications from interviews that contracts may in fact become *more* informal (and less controlling) over time, under the described transaction cost situations buyers should be cautious about adopting VC structures that are more complex, costly, and controlling than marketing contracts (or, at most, resource contracts). Development actors should likewise exercise prudence in subsidizing such arrangements. Given the theoretical and actual dominance of marketing cooperatives, buyers searching for farmer suppliers should probably target such organizations.

However, when buyers propose and negotiate purchase terms with marketing cooperatives, they should account for the relatively high governance costs borne by these organizations.

8.3. Directions for future research

Although the case study data do not provide conclusive support for the first hypothesis, analysis of the results points to some promising possibilities for improving the framework. First, it appears that the VC and HC structure choice are partially inter-dependent, and thus an improved coordination framework should introduce the presence of other governance structures as a fifth transaction cost-related determinant. Second, further research can more thoroughly explore the potential influence that informal coordination mechanisms (such as reputation and trust) play in the governance structure choice.

A third research avenue is further specification of other governance structures that are not yet represented in the VC and HC continuums. For example, the Mali research found significant variation within the marketing cooperative category and within the marketing contract category. Also, why do marketing cooperatives in Mali demonstrate a tendency to become larger, while marketing contracts tend to simplify over time, and what are the key characteristics and determinants of each iterative structure within these categories?

This research also documents a possible third dimension of value chain coordination that is necessary to link farmers to markets: coordination between farmers and input/service providers. Interviews reveal that there exist a number of possible governance structures that serve this purpose. For example, throughout the cases farmers' access to fertilizer (both subsidized and unsubsidized) was facilitated through several different arrangements: simple cash purchases; through credit extended by the fertilizer distributor; and sometimes through an interlinked mechanism in which farmers receive fertilizer, credit, and marketing assistance from the same

service provider. Poulton and Lyne (2009) identify these arrangements as a third important dimension of coordination.⁸⁹ While this dimension does appear essential to the smallholder market linkages puzzle, further theoretical work is required to distinguish it from (or, conversely, to identify it with) the other forms of coordination, and to specify the range of governance structures that provide such coordinate, and to describe the determinants of these structures.

Finally, testing the framework on a more heterogeneous set of cases should strengthen the framework's external validity. This should also provide a clearer picture of the type transaction costs and governance structure models that tend to dominate for different commodities and contexts. A related empirical question is: which value chain actors bear the primary governance and transaction costs of economic coordination under different transaction conditions? Do value chain actors equally share these governance costs? Or do particular value chain actors emerge as clear coordination "leaders" in different situations? If coordination leadership indeed emerges, can this be predicted by the set of transaction characteristics, or are other important characteristics influencing these outcomes? This research question would appear to bear some importance on the practical issue of which value chain segments and actors are best positioned to lead the coordination of value chains that are challenged by significant transaction costs, and

⁸⁹ Poulton and Lyne (2009) emphasize that farmers' use of these inputs is oftentimes highly complementary, to the extent that farm productivity and profitability depend on their simultaneous provision. Notwithstanding whether there is need for an additional category of coordination, Poulton and Lyne (2009)'s analysis is extremely relevant to development contexts where intensive production systems have not yet taken off. In these settings, low demand for commercialized inputs can result in thin input markets, and government service may not necessarily fill the gap. Moreover, the timely and efficient provision of complementary inputs to farmers can affect the entire value chain's capacity to respond competitively to market demands. As this chapter shows, several of the vertical and horizontal governance structures described in the TCE literature emerge in part to address these upstream issues. Despite its importance, Poulton and Lyne (2009) observe that this type of coordination issue has received insufficient attention in the TCE literature; perhaps, they reason, because the issue "tends to disappear" once agricultural productivity is boosted to a certain level and market densities increase.

how exactly such coordination can be encouraged by targeted investments, technical support, or regulatory reforms.

APPENDICES

APPENDIX 1

Photographs illustrating transaction characteristics

1. Asset Specificity

Figure 5: Farm assets representing low and intermediate asset specificity



Most farm assets (first three images) are employed to produce cereal crops that can be consumed by the household or sold on a relatively competitive output market. However, the time investment made to hand-sift (fourth image) impurities from grains is a special practice that is required to meet quality standards for some niche food processors and markets.

Figure 6: Wholesaler assets of low specificity



The most important fixed investments owned by interviewed wholesalers are trucks (first image) and warehousing facilities (second image).

Figure 7: Processor assets of intermediate/high specificity



SME processors make investments in semi-industrial equipment, such as in rice mills (first image). The millet/sorghum processors have made further investments in facilities to closely control quality (second image), and in marketing assets such as packaging, trade shows, and quality certifications.

2. Frequency

Figure 8: Intermediate/high transaction frequencies



The level of asymmetric scale between cereal farmers and buyers is the most important factor determining transaction frequency. Individual farmers are often dispersed (first image) and market very limited volumes of cereals (second image), requiring a large aggregation effort (third image) to meet the large throughput needs of buyers.

3. Uncertainty

Figure 9: Sources of uncertainty



Uncertainty in Malian cereal value chains have several causes. Climactic variability such as drought can result in partial or total crop loss (first image). Uncertain access to credit limits farmers' access to improved inputs such as fertilizer (second image) and equipment (third image). Machine breakdowns (fourth image) also frequently negatively affect supply.

4. Externalities

Figure 10: Quality debasement



The major externality problem present in cereal transactions is quality debasement, the majority of which appears to occur at the farm level. Farm practices that degrade cereals quality, such as threshing by driving trucks over millet stocks (first image), pose problems to millet and sorghum processors, rice millers, and institutional buyers. These actors must closely examine purchased grains for quality (second image), and sometimes undertake costly processes to clean grains (third image).

Figure 11: Weight losses



Some processors reported that the actual weight of purchased cereal volumes commonly falls short of their assumed marketed weights. While a single reason for weight problems could not be confirmed, actors suspected a number of causes, including weighing errors due to the downstream use of different old or lower quality scales (figures 23 and 24).

Figure 12: Poor maintenance of ON irrigation canals



Rice irrigation systems in the ON are troubled by stakeholders' (the ON, private contractors, and FOs alike) low compliance with canal maintenance regulations. As a consequence of this mutual neglect, late flooding plagues the system, a high degree of water loss, and inadequate drainage leading to increased production costs, as well as production and/or quality loss.

APPENDIX 2

Information contained in marketing contracts

Below is a synthesis of the information contained in the written contracts that were used in the Mali cases between farmer organizations and different buyers (wholesalers, processors, and institutions), across commodities. These contracts typically contained the following elements and information, with special exceptions noted. Figure 27 demonstrates these elements as combined into an actual contract.

- *Basic information on each of the legal parties.* Information includes addresses, phone contacts, and the name and signatures of the legal representatives of each contracting entity. Some marketing contracts are signed before or during the production season (ranging from April to November), while others are signed after harvest, during the commercial season. In a few instances, project partners are mentioned in the contract as a third party that supports and monitors farmers' post production activities, but it isn't clear that these third parties hold any legally binding responsibility.
- *Quality standards.* Most written contracts include the following quality requirements, with little variability: low humidity (11-13% maximum for coarse grains, 13-15% for rice); few organic and inorganic impurities (2% maximum for both); few broken grains (1% -2% max for dry grains, 3-4% for rice); originating from the most recent harvest; homogenous in variety; absent of infestations, mold, and abnormal odors. One contract with an industrial mill further specified low levels of aflatoxins (for maize, less than 20 parts per billion). In cases where such specifications are not documented, the contract at least makes reference to a "previously agreed-upon quality."
- *Quantity specifications.* A fixed quantity to be transacted is always documented within the contract. In a few cases, these quantities represent a minimum, and sellers have the option of delivering more. One contract with an SME processor fixes such a minimum which the farmer organization is to reserve in its warehouses, and which the processor commits to buying in multiple transactions throughout the marketing season.
- *Price determination.* Short-term contracts stipulate an agreed-upon price, while longer-term contracts specify a simple price determination formula (sometimes contained within an *avenant*, or contract amendment, to be signed at the time of the actual physical order), which is usually based on a current OMA reference price (wholesale or farm gate) for that commodity for the zone in which ownerships of the grains changes. For millet and sorghum, a price premium of 20 to 40 USD/MT is sometimes added to the referenced market price, on the condition that the quality standards are met. A few contracts stipulate that both the buyer and seller reserve the right to reduce quantities or renegotiate prices in the event of high market variability at the time of the transaction, although variability thresholds are not defined.

- *Delivery directives.* Deliveries can take place beginning in November, and run through the commercial season. Longer-term contracts usually define a delivery time window in advance (or else within a couple weeks of the signing of the contract amendment), whereas short term contracts require delivery within 15 to 80 days of the contract signatures. Sellers are usually responsible for transport of the goods to the buyer's specified warehouse location, but sometimes the buyer takes charge of transport, in which case pickup from the seller is arranged at a central point. Ownership changes when the goods change hands, with the party taking charge of transport responsible for any losses at that stage. Cereals are typically delivered in 100kg polypropylene sacks.
- *Final Inspections.* Although the contract sometimes requires the seller to conduct inspections before transport, the buyer always makes final determination of quality and quantities after delivery at the buyer's warehouse, although the seller has the option of sending an agent to observe the final inspection.
- *Payment modality:* The buyer makes payments by bank transfer or check, within 5 to 30 days (but up to 60 days for one institution) after he or she physically receives and inspects the goods.
- *Penalties:* Most contracts stipulate some possible penalty that can be imposed should the seller fail to meet the contract terms. Penalties include total or partial rejection of the product, the seller being blacklisted from a list of preferred suppliers, some deduction of price (ranging up to 1%) for each day that the delivery delayed, or the reduction of price by a negotiated amount. A few contracts require the seller to pay a guarantee worth 5% of the transaction value, which can be automatically forfeited in the event that contract terms are not met. With one exception, no contracts stipulate penalties against the buyer in the event that it breaches contract. Some qualify the terms with a *force majeure* exception, but which usually do not define the relevant conditions beyond citing as examples drought and insect invasion.
- *Dispute mechanisms.* In the event of a contract dispute, parties usually commit to seeking a resolution either through "friendly means" (this meaning left vague) or through arbitration by two arbiters chosen by the two parties. In the event that this fails, some contracts state that the next level of recourse is litigation and adjudication by the appropriate judicial body.

Figure 13: Illustrative marketing contract

CONTRAT D'ACHAT DE MAIS - n° [REDACTED]

Entre les soussignés :

[REDACTED]

Ci-après dénommée **LE VENDEUR**

D'une part,

[REDACTED]

ci-après dénommée **L'ACHETEUR**

D'autre part,

Les parties se sont rapprochées et après discussions sur une campagne d'achat de matières premières et plus particulièrement du maïs récolte 2010, elles ont arrêté et convenu ce qui suit :

Article 1er : Objet

Le vendeur vend à l'acheteur du maïs aux caractéristiques ci-après définies:

Couleur	maïs jaune et/ou blanc
Humidité	maxi 12 PCT
Insecte et/ou produit affecté par les insectes :	absence
Grains cassés ou abimés, présence d'épis :	< 1 PCT
Présence de céréales différentes du maïs :	< 1 PCT

Article 2 : Conditionnement

Le maïs est livré dans des sacs de +/- 100 kilogrammes.

Article 3 : Quantité

La quantité commandée par l'acheteur est de **500 (cinq cents) tonnes**.

Article 4 : Prix

Le prix convenu d'accord parties est fixé à **130 000 FCFA (cent trente mille FCFA) la tonne nette rendu**

[REDACTED]

Durant la période contractuelle, le prix n'est pas révisable.

A la fin de l'exécution du présent contrat, les parties pourront convenir d'un nouveau contrat.

[REDACTED]

Figure 13 (cont'd)

Articles 5 : Délai de livraison

Le vendeur s'engage à livrer la quantité contractuelle dans un **délai de (02) deux mois**, à compter de la date de signature du présent contrat.

Article 6 : Inspection de la marchandise

Le poids du maïs livré ainsi que la détermination du taux de déchet et d'impuretés seront déterminés par le service qualité de [REDACTED] avant tout déchargement en présence du mandataire de l'acheteur.

S'il s'avère que la qualité de la marchandise ne répond pas à la qualité spécifiée dans le présent contrat, la société [REDACTED] a plein pouvoir de refuser la marchandise ou d'accepter le maïs avec une remise correspondante fixée d'un commun accord.

Article 7 : Modalités de paiement

L'acheteur payera au vendeur par lot réceptionné de **deux camions de 40 tonnes** suivant le ticket pont bascule des [REDACTED]

Ce paiement s'effectuera par virement sur le compte indiqué par le fournisseur sur présentation d'une facture, accompagnée des bons de réception et des tickets pont bascule des [REDACTED]

Ce paiement s'effectuera au plus tard huit (08) jours après réceptions des documents cités ci-dessus.

Article 8: Clauses attributives de juridiction et élection de domicile

Tous litiges relatifs à la formation, à l'exécution et à l'interprétation du présent contrat seront réglés à l'amiable par les parties.

A défaut, le litige sera porté devant la Juridiction compétente de Bamako.

Les parties font élection de domicile en leurs demeures respectives.

Fait à [REDACTED] le 2 février 2014
en deux (2) exemplaires originaux

Pour [REDACTED]
[REDACTED]

Pour [REDACTED]
[REDACTED]

[REDACTED]

APPENDIX 3

Results of sensitivity analyses

Sensitivity analysis of the coordination framework was conducted using the Mali cereals data, in order to evaluate the robustness of the framework, and to get an idea for how different transaction characteristic scenarios might predict different governance structures.

To illustrate the results-derivation process outlined in Section 3.1, the worksheets used to tabulate governance structure scores for the standard coordination framework (as presented in the body of this thesis) and current/baseline transaction characteristic scenario (as presented in the body of this thesis) are presented in Tables 8 and 9 as examples.⁹⁰

Results using different frameworks. Sensitivity analysis is first conducted by maintaining the transaction characteristic scores presented in this thesis, while varying key framework parameters in three different ways.

- (1) *Standard framework.* The coordination framework as presented in the body of the thesis (no parameters were changed).
- (2) *Omitting externalities as an independent variable.* Only asset specificity, frequency, and uncertainty are analyzed. This modification makes the coordination framework correspond to most other applied TCE models in terms of the independent variables/determinants of transaction costs and governance structures.
- (3) *Omitting resource contracts as a governance structure.* Marketing contract and resource contract are folded into one governance structure category: specification contracting. Thus, in the table “contract” encompasses both contract types. This modification makes the coordination framework correspond to Sartorius and Kirsten (2007; 2005)’s applied TCE model in terms of dependent variables.
- (4) *Omitting both externalities and resource contracts.* Modifications 2 and 3 are both made to the coordination framework.

Table 10 compares the results of the modified frameworks (presented in columns 2 to 4) to the results of the standard model (column 1). Omitting externalities (2 and 3) reduces the spread of points across different HC structures, but for these cases does not affect the ultimate HC prediction. Omitting the resource contract structure category (3) does not affect the HC

⁹⁰ For the VC and HC dimensions, the predicted structure is the one receiving the most points (or Xs), visually indicated by the cell(s) receiving the darkest color for each case. A tie suggests a range of predicted structures. The VC scoring includes more points than for HC because in many case farmers often transacted with multiple buyers, each of whom might face varying transaction characteristics. Thus, the results will present a range of VC structures appropriate for those buyers.

dimension predictions. For the VC dimension, omitting externalities (2 and 3) generally increases the number of partially correct predictions, suggesting that for these cases externalities is an important independent variable for arriving at more precise predictions. Using a single “contract” category (3) slightly improves the framework performance for the VC dimension, although the framework loses precision as to whether the predicted contract structure simply provides market information, or both market information and resources and technical advice. These results generally suggest that the standard framework (1) used in this research is the best of the four possible framework iterations in terms of the most precise and correct predictions.

Results of different transaction characteristic scores. Sensitivity analysis is then conducted by maintaining the standard framework, while varying the scoring of different transaction characteristic variables. The scores for one variable at a time are changed, while holding the other variables’ scores constant (at their baseline values). The below alternative transaction characteristic scenarios were analyzed.⁹¹

- (5) *Higher asset specificities.* The asset specificity scores for buyers and farmers are increased by one point, compared to the baseline scores. This simulates a scenario in which all actors make more specific investments in assets, possibly in response to further segmented cereal markets.
- (6) *Very low transaction frequencies.* The frequency scores for all actors are reduced to one, simulating an extreme scenario in which cereal commodities were traded very infrequently each year, and in which there is minimal asymmetric symmetry between farmers and buyers.
- (7) *Reduced uncertainties.* The uncertainty scores for all actors are reduced by one point, simulating a scenario in which policy reform effectively reduced the uncertainty in cereal markets.
- (8) *Very low externalities.* The externality scores for all actors are reduced to one, simulating an extreme scenario in which quality debasement, irrigation maintenance issues (for rice), and weight reductions were effectively redressed.

Table 11 presents the results of different transaction characteristic score scenarios. With increased asset specificity (5), farmers are predicted to move to marketing cooperatives (with possibly some cases of NGCs for rice and millet/sorghum). For VC, the precision of the predictions decreases, with most buyers expected to use either resource contracts or some form of alliance to protect against opportunism. In a situation of very low transaction frequencies (6), maize farmers are predicted to trade individually, while rice and millet/sorghum farmers would remain organized in marketing cooperatives. The VC predictions do not vary significantly compared to the baseline scenario. Next, the framework predicts that reduced uncertainty in cereal markets (7) would require less farmer coordination, with most farmers trading in bargaining associations and possibly a few in marketing cooperatives. The VC predictions do not

⁹¹ Since the scores used for these analyses were not empirically obtained, the results were not evaluated in terms of number of correct, partially correct, and incorrect predictions.

vary significantly compared to the baseline scenario, although there is a greater range of predicted structures. Finally, reducing externalities generates HC predictions that are identical to the HC results when externalities are omitted altogether (4). Results for the VC dimension are also very similar.

Table 8: Governance structure scoring worksheet – vertical coordination

Structure: Transaction Characteristics:	Spot	Marketing	Resource	Relationship	Equity	Vertical Integration
Asset Specificity	Very Low (1)	Low (2)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Frequency	Very Low (1)	Low (2)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Uncertainty	Very Low (1)	Low (2)	Intermediate (3)	High (4)	High – Very High (4-5)	Very High (5)
Externalities	Very Low (1)	Low (2)	Intermediate (3)	High (4)	High – Very High (4-5)	Very High (5)
Cases:						
R1			X	XXX		
R2		X	XXX	X		
R3		XX	XXX	X	X	
R4		XX	XXX	X	X	
R5		XX	XXX	X	X	
M1		XX	XX	X		
M2		XX		X	X	
M3		XX	XX	X		
M4		XX		X	X	
M5		XX		X	X	
M6		XXX	XX	X	X	
MS1		X	XX	X		
MS2		XXX	XXXX		XX	
MS3		XX	XXX	X	X	
MS4		XX	XXX	X	X	

Table 9: Governance structure scoring worksheet – horizontal coordination

Structure: Transaction Characteristics:	Autonomous Farmers	Bargaining Cooperative	Marketing Cooperative	New Generation Cooperative	Investor- Owned Firm
Asset Specificity	Very Low (1)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Frequency	Very Low (1)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Uncertainty	Very Low (1)	Low (2)	Intermediate (3)	High (4)	Very High (5)
Externalities	Very Low (1)	Low (2)	Intermediate (3)	High (4)	Very High (5)
CASES:					
R1		X	XXX		
R2		X	XXX	X	
R3		X	XXX	X	
R4		X	XX	X	
R5		X	XX	X	
M1	X	XX	X		
M2	X	XX	X	X	
M3	X	X	XX		
M4	X	X	XX	X	
M5	X	X	XX	X	
M6	X	X	XX	X	
MS1		X	XXX		
MS2		XX	XX	X	
MS3		X	XXX	X	
MS4		X	XXX	X	

Table 10: Sensitivity analysis results using different frameworks.

ACTUAL Horizontal Structure	PREDICTED Horizontal Structure				Case	ACTUAL Vertical Structure	PREDICTED Vertical Structure			
	(1) Standard framework	(2) Without Externalities	(3) Without Resource Contracts	(4) Without Externalities & Resource Contracts			(1) Standard framework	(2) Without Externalities	(3) Without Resource Contracts	(4) Without Externalities & Resource Contracts
INDIVIDUAL FARMERS	Bargaining	Bargaining	Same as standard	Same as (1)	M1	RESOURCE	Resource	Market-Resource	Contract-Relation	Relation
	Bargaining	Bargaining	Same as standard	Same as (1)	M2	MARKETING	Marketing	Market-Equity	Contract	Contract-Equity
Village BARGAINING ASSOCIATIONS	Marketing	Marketing	Same as standard	Same as (1)	R1	RESOURCE & RELATION	Relation	Relation	Relation	Relation
	Marketing	Marketing	Same as standard	Same as (1)	R2	RESOURCE	Resource	Resource	Relation	Relation
Village MARKETING COOPERATIVES	Marketing	Marketing	Same as standard	Same as (1)	M3	MARKETING	Resource	Market-Resource	Contract-Relation	Relation
	Marketing	Marketing	Same as standard	Same as (1)	MS1	MARKETING	Resource	Market-Relation	Relation	Relation
	Marketing	Marketing	Same as standard	Same as (1)	MS2	MARKETING	Resource	Market-Relation	Contract	Contract
Regional MARKETING COOPERATIVES	Marketing	Marketing	Same as standard	Same as (1)	MS3	SPOT & MARKETING	Resource	Market-Resource	Relation	Contract-Relation
	Marketing	Marketing	Same as standard	Same as (1)	R3	SPOT & MARKETING	Resource	Market-Resource	Relation	Contract-Relation
	Marketing	Marketing	Same as standard	Same as (1)	MS4	MARKETING	Resource	Market-Resource	Relation	Contract-Relation
	Marketing	Marketing	Same as standard	Same as (1)	M4	SPOT & MARKETING	Marketing	Market-Equity	Contract	Contract-Equity
	Marketing	Marketing	Same as standard	Same as (1)	M5	SPOT & MARKETING	Marketing	Market-Equity	Contract	Contract-Equity
Service Provider MARKETING COOPERATIVES	Marketing	Marketing	Same as standard	Same as (1)	M6	SPOT & MARKETING	Marketing	Market-Resource	Contract	Contract-Relation
	Marketing	Marketing	Same as standard	Same as (1)	R4	MARKETING	Resource	Market-Resource	Relation	Contract-Relation
	Marketing	Marketing	Same as standard	Same as (1)	R5	MARKETING	Resource	Market-Resource	Relation	Contract-Relation
	Correct: 11 Partial: 1 Incorrect: 3	Correct: 11 Partial: 1 Incorrect: 3	Correct: 11 Partial: 1 Incorrect: 3	Correct: 11 Partial: 1 Incorrect: 3			Correct: 2 Partial: 5 Incorrect: 8	Correct: 1 Partial: 14 Incorrect: 0	Correct: 3 Partial: 6 Incorrect: 6	Correct: 2 Partial: 9 Incorrect: 4

Table 11: Sensitivity analysis results for different transaction characteristic scores

ACTUAL Horizontal Structure	PREDICTED Horizontal Structure					Case	ACTUAL Vertical Structure	PREDICTED Vertical Structure				
	(1) Baseline Scenario	(5) Higher Asset Specificities	(6) Very Low Transaction Frequencies	(7) Reduced Uncertainties	(8) Very Low Externalities			(1) Baseline Scenario	(5) Higher Asset Specificities	(6) Very Low Transaction Frequencies	(7) Reduced Uncertainties	(8) Very Low Externalities
INDIVIDUAL FARMERS	Bargaining	Marketing	Autonomous	Bargaining	Bargaining	M1	RESOURCE	Resource	Marketing-Resource	Spot-Relation.	Marketing	Resource
	Bargaining	Marketing	Autonomous	Bargaining	Bargaining	M2	MARKETING	Marketing	Marketing-Equity	Marketing	Marketing	Resource
Village BARGAINING ASSOCIATIONS	Marketing	Marketing	Marketing	Bargain-Market	Marketing	R1	RESOURCE & RELATION	Relation	Relation	Relationship	Resource	Relationship
	Marketing	Marketing-NGC	Marketing	Bargain-Market	Marketing	R2	MARKETING & RESOURCE	Resource	Resource-Relationship	Resource	Market-Resource	Resource
Village MARKETING COOPERATIVES	Marketing	Marketing	Autonomous	Bargaining	Marketing	M3	MARKETING	Resource	Relationship	Market-Resource	Marketing	Resource
	Marketing	Marketing	Marketing	Bargain-Market	Marketing	MS1	MARKETING	Resource	Relationship	Resource	Marketing	Spot-Relationship
	Marketing	Bargaining-NGC	Marketing	Bargaining	Marketing	MS2	MARKETING	Resource	Resource	Resource	Market-Resource	Market-Resource
Regional MARKETING COOPERATIVES	Marketing	Marketing-NGC	Marketing	Bargain-Market	Marketing	MS3	SPOT & MARKETING	Resource	Resource-Relationship	Resource	Market-Resource	Market-Resource
	Marketing	Marketing-NGC	Marketing	Bargain-Market	Marketing	R3	SPOT & MARKETING	Resource	Resource-Relationship	Resource	Market-Resource	Market-Resource
	Marketing	Marketing-NGC	Marketing	Bargain-Market	Marketing	MS4	MARKETING	Resource	Resource-Relationship	Resource	Market-Resource	Market-Resource
	Marketing	Marketing	Autonomous	Bargaining	Marketing	M4	SPOT & MARKETING	Marketing	Marketing-Equity	Marketing	Spot-Equity	Spot-Equity
	Marketing	Marketing	Autonomous	Bargaining	Marketing	M5	SPOT & MARKETING	Marketing	Marketing-Equity	Marketing	Spot-Equity	Spot-Equity
Service Provider MARKETING COOPERATIVES	Marketing	Marketing	Autonomous	Bargaining	Marketing	M6	SPOT & MARKETING	Marketing	Marketing-Equity	Marketing	Marketing	Market-Resource
	Marketing	NGC	Marketing	Bargaining	Marketing	R4	MARKETING	Resource	Resource-Equity	Resource	Market-Resource	Market-Resource
	Marketing	NGC	Marketing	Bargaining	Marketing	R5	MARKETING	Resource	Resource-Equity	Resource	Market-Resource	Market-Resource

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