

Title of the Paper

Can supply chain's coordination mechanisms include small holders? Insight from an empirical work in Costa Rica.

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Paper / poster prepared for presentation at the 106th seminar of the EAAE

Pro-poor development in low income countries: Food, agriculture, trade, and environment

25-27 October 2007 – Montpellier, France

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Can supply chain's coordination mechanisms include small holders? Insight from an empirical work in Costa Rica.

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Abstract:

Small holders' agriculture is currently facing new stakes due to State's withdrawal from agricultural support and to higher market requests for producing agricultural products. Different coordination mechanisms can be observed inside the supply chains involving farmers, farmers' organizations, and others stakeholders. They depend on the nature of the product, the characteristics of the stakeholders involved, the technical specifications related to the transactions, and the institutional environment. Relying on a comparative case study methodology, the paper analyzes the consequences of different coordination mechanisms on inclusion or exclusion of small farmers in the northern region of Costa Rica. Market coordination could be an efficient way to integrate farmers in supply chains in the case of low technical specifications and of existence of adequate selling mechanisms. Hybrid coordination is the main mechanism and facilitates the inclusion of small farmers, depending on the farmers' organizations capacities to negotiate adequate rules. In some situations hybrid coordination with captive relationships could occur but leads to a more or less rapid exclusion process.

Keywords: Supply chain, Small holders, Farmers' organization, Contracting, Coordination, Costa Rica

1 Introduction

1.1 Economic liberalization and coordination mechanisms

In developing countries the agricultural sector is rapidly changing. On the one hand, the new public policies encourage the State withdrawal from agricultural supports and the liberalization of trade exchanges. On the other hand, corporate food producers and processors, food industries, and the supermarkets have a stronger influence on smallholders' production systems and market orientation (Berdegué et al. 2005). These changes illustrate a harder competition on the international markets but also more concerns from the consumers' point of view for product characteristics. In this sense, quality standards, impacts on the environment, and laborers' conditions involved in the process become important issues for product choice.

In this context new coordination mechanisms occur to deal with such evolutions, especially amongst farmers themselves, and between farmers' organizations and food industries or supermarkets. These coordination mechanisms are usually based on contractual arrangements with different specifications derived from a negotiation process. The nature of the coordination depends on the stakeholders' strategies and resources. The coordination takes place in asymmetrical conditions between stakeholders and generates new commodity chains' governance mechanisms. In fact the new context leads a rapid evolution at the production level to improve the quality and stability in order to comply with the demand of food industries and supermarkets. Small farmers face huge challenges to really benefit from opportunities derived from this new market conditions and to avoid an exclusion process. To access to markets smallholders need to develop new capabilities and skills, both individually at farm level and collectively at farmers' organization level.

The paper seeks to understand the effects of different coordination mechanisms on smallholders and their organizations, within different supply chains. More specifically our analysis is focused on the strategies followed by farmers in northern Costa Rica in order to gain access to the markets.

1.2 What is saying the literature about the theoretical background?

In the new institutional economics field, the coordination mechanisms are diverse and aimed at limiting the transaction costs. The transaction costs are positively related with (i) the uncertainty about the product and the stakeholders' behavior and (ii) the specific assets and investments of each stakeholder. They are negatively related with the transaction frequency which improves the information on each stakeholder and the trust among them (Williamson, 1991). This author identifies basically three coordination mechanisms: the market, the hierarchy and hybrid coordination. The market coordination refers to situation where the different actors of the transaction freely transfer property rights taking into account only the price of the product as reference of the transaction. The hierarchical coordination refers to situation where the relationship between actors is ruled by the authority not by the price of the product. The hybrid form refers to situation where the relationship between actors is ruled not only by the price but also by other factors including social factors (habit, convention, etc.). According to the literature, the market coordination tends to be more efficient when the transaction costs are low, which rarely occurs in the agricultural sector, the hierarchy coordination when there are high levels of transaction

costs and risks. Between these two poles, hybrid coordination mechanisms arise and some of them in the form of contractual arrangements. Therefore, contracts take an intermediate position, allowing the buyer to participate and exert different levels of control over the production process without formal property rights on the provider's assets. Contract allows a reduction of the risks and the transaction costs (Key and Runsten, 1999). Under certain market conditions, contracts may induce or not induce collective actions among stakeholders (Sáenz, 2006). There is not a single type of contract and a large set of options are usually adopted. Hobbs (1996) describes different types of contract with (i) contracts defining the characteristics of the product, (ii) contracts including in addition controls on the process to produce the product, and (iii) contracts including in addition services providing to guarantee the process and the product quality. Taking into account the diversity of relationships between actors and, besides market and hierarchy, Gereffi et al. (2005) consider a spectrum running from low to high level of coordination and power asymmetry between buyers and suppliers. In the modular chain the two actors are quiet independent with low level of specific assets, the relational value chain creates mutual dependence with high level of specific assets, in the captive chains the small suppliers depend on much larger buyers.

The nature of the contract depends on the negotiation between stakeholders. Williamson (1991) shows that some parameters influence the nature of the contract: (i) the uncertainty related to the level of information on the market and the stakeholders' behavior, (ii) the negotiation power related to economic and political strength of each stakeholder, (iii) the level of specialization related to the flexibility of each stakeholder to be able to transform its production system, and (iv) the enforcement system base on trust relationships or legal frameworks. But the contract is insufficient to understand the complexity of the coordination mechanisms, especially in the rural area. From his point of view, Albert (2000) adds to the three main "classical" modalities of coordination the non-market solidarity system participating in the regulation of the relationships between farmers based on different values.

According to this conceptual framework in the agricultural sector the coordination mechanisms largely depend on the supply chain characteristics. The parameters which have an influence on the supply chains are (Faure 2007), (i) the kind of the product (especially the perishability) and the techniques to process the product, (ii) the characteristics of the stakeholders especially the geographical distribution and the level of specialization of the farms or the specific investments in the food industries, (iii) the market requests with more or less in depth technical specifications, and (iv) the institutional framework including public policies and access to services. Among farmers and inside farmers' organizations the coordination mechanisms tend to be mainly based on non-market solidarity system, contracts or hierarchy. Between farmers' organizations and processors, supermarkets, or exporters the coordination mechanisms are mainly based on contracts. But in some cases occur coordination mechanisms through spot market or hierarchy at different level of the supply chain. In some supply chains more global institutional arrangements as inter professional bodies or quaternary institution (Bourgeois, 1998), are implemented to facilitate common agreements between the main stakeholders.

Small farmers' should gain a better access to international and national markets if they move into integrated supply chains with others stakeholders. A better integrated supply chain should lead to a minimization of the system-wide costs (including transaction costs), while satisfying as much as possible the stakeholders' objectives (Simchi-Levi et al., 2000).

However, there are also evidences that this integration benefits only certain type of farmers, while excludes part of the smallholders. Literature review enables to identified different types of specific constraints concerning smallholder farmers that lead to market exclusion: (i) specific production constraints with limited access to production factors (land, labour force and capital), (ii) lack of human and social capital including low bargaining power, (iii) specific trade constraints such as a lack of infrastructures or market entry barriers, (iv) high transaction costs related to access to information, negotiation and monitoring, and (v) risks management related to the natural environment, the prices or the behaviour of the stakeholders (Ruben et al. 1994, Jaffee S. 1995, Bienabe et al. 2004).

A supply chain integrating small farmers is based on the implementation of alternative markets institutions, and a collaborative-based strategy to link stakeholders' operations in order to improve the position in the market (Sáenz 2006). Some authors have pointed out the importance of farmers' organizations or cooperative in order to limit the transaction costs and to gain better bargaining power (Dyer and Singh 1998, Key and Runsten 1999). Farmers' organizations play different instrumental functions in designing collective actions: (i) economic functions in the field of production, processing and marketing of agricultural products or in the field of natural resources management, (ii) social functions for its members or for the rural community through advocacy, information sharing, capacities strengthening, or coordination between stakeholders from the local to the global level (Rondot and Collion, 2001, Bosc et al. 2003). To improve their position in the supply chain farmers through farmers' organizations intent to promote (i) new forms of smallholders cooperation that focus on developing dynamic competitive advantages (Menard, 2004) or (ii) new collective strategies for reaching economies of scale in marketing operations, strengthening bargaining power, controlling risks, creating alliances for improving competitiveness through upgrading of quality and generating aggregated value (Bijman and Ruben, 2005). The key issues for farmers' organizations are related to coordination mechanisms among members and to coordination mechanisms between farmers' organization and others stakeholders (Biénabé et al. 2004, Ménard 2007).

1.3 Methodological approach

The paper is based on the comparison of four empirical supply chains case studies of the main agricultural products in the northern region of Costa Rica: beef, milk, bean, and pineapple. For each case study we drew a map of the stakeholders involved in the supply chain. We carried out surveys : (i) at farm level (farming system analysis, historical evolutions, farm typologies, marketing strategies, etc.), (ii) with the main farmers' organizations involved in the supply chain (history, activities, rules, external relationships, etc.), (iii) with some of the private firms involved in the supply chains (activities, sourcing with local farmers and sourcing from others stakeholders, etc.), and (iv) with the main bodies as boards, committees, or national organizations regulating the relationships in the supply chain (objectives, activities, main results, etc.).

Coordination is analyzed through transaction. We distinguish three theoretical stages: production, transformation, and distribution that we consider as a transfer of property rights (North, 1990). For each transaction, we describe the relationships existing between them. We put special emphasis on (i) the formal and informal rules regulating these transactions especially between farmers and farmers' organizations and between farmers' organizations

and others stakeholders and (ii) the governance structure. A governance structure can be defined as the “*authority and power relationships that determine how financial, material and human resources are allocated and flow within a chain*” (Gereffi, 1994). More generally, it refers to the ability of an actor to strongly influence or even determine the activities of other actors in the chain.

In the next section we describe the coordination mechanisms that characterize each one of the supply chain studied, and show how these coordination mechanisms have evolved through time. We then analyze some attributes of transactions, thus providing explanatory elements of the situations described. In section 3 we demonstrate that these different coordination mechanisms have different implications on farmers and farmers’ organizations.

2 Description of coordination mechanisms in different supply chains

After a long period of strong State interventions in agriculture to promote food crops for the national market, from the mid-80’s the country encouraged exported crops through new farmers’ organizations or private export firms. From the mid-90’s the State reduced its intervention in this region modifying the rules of the game. The farmers involved in the different supply chains have different characteristics but most of them face strong difficulties explaining a regular decrease in the farms number (table 1).

Table 1: Characteristics of family farms in the Northern Region

Type of farm	Livestock (beef) and food crops (bean, rice, etc.) with mechanization	Extensive livestock (beef)	Livestock producing cheese and beef	Livestock producing milk	Exported products : pineapple, yucca, plantain, ornamental plants, etc.	Sugar cane	Diversified farms (organic agriculture, rural tourism, etc.)	Settlement in difficult (livestock food crops cash crops)
Number of farmers	2000	1500	3500	1500	3500	1000	1000	4000
Surface / farm (ha)	50-300	50-500	10-50	10-50	1-30	3-100	5-30	5-20
Evolution of the farmers’ number *	--	--	-	-	-	0	++	--

From Faure and Samper 2005

* : ++ : strong increase ; + : light increase; 0 : stability ; - : light decrease ; -- : strong decrease

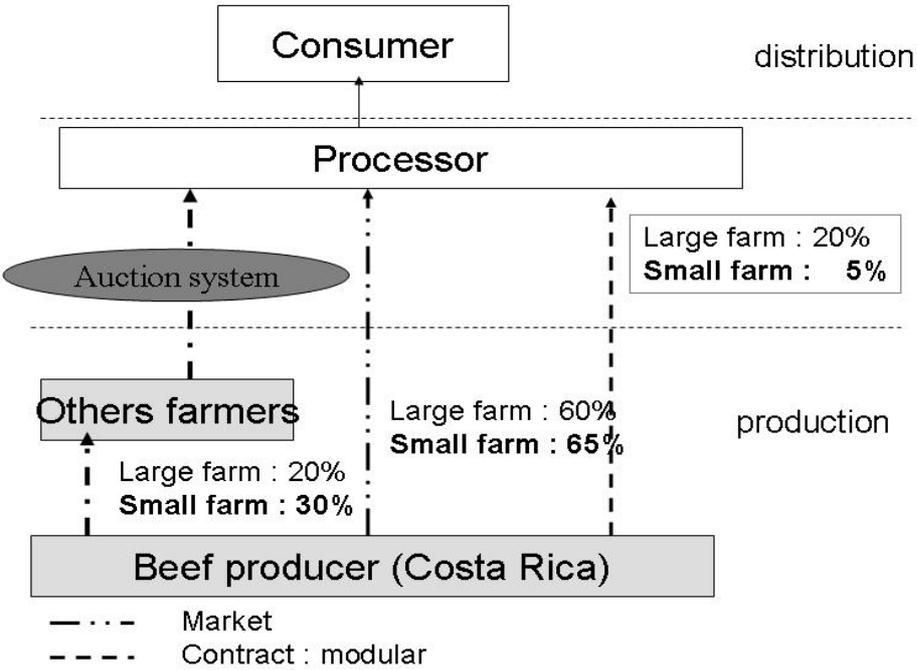
The evolutions of coordination mechanisms are quite different depending on the supply chain (Maitre d’Hôtel, 2006), and thus on the four parameters mentioned above (kind of the product, characteristics of the stakeholders, market requests, and institutional environment).

2.1 Beef sector

The beef sector is one of the oldest and most important for small farmers in the northern region (table 1) but with few stakeholders involved in the downstream segment of the supply chain. The market coordination is the main modality unchanged for many years as all large scale farmers directly sell their cattle through three auctions market located in the region and usually managed by special farmers’ organizations (CORFOGA, 2005). Small farmers sell their animals either directly in the auctions markets or through intermediaries able to transport them to the auction market place. The auctions market functions as a spot

market where the demand meets the offer with some transparency in the price definition. Part of the exchanges is also between farmers specialized in some rearing activities, and part is between farmers and firms working with slaughterhouses. But in this latter case, contract coordination mechanism is more developed and involves especially large scale farmers that are more able to negotiate directly with processors (figure 1) but without strong technical specification which implies “modular coordination” in the sense of Gereffi et al. (2005).

Figure 1: Coordination mechanisms in the beef sector



2.2 Bean sector

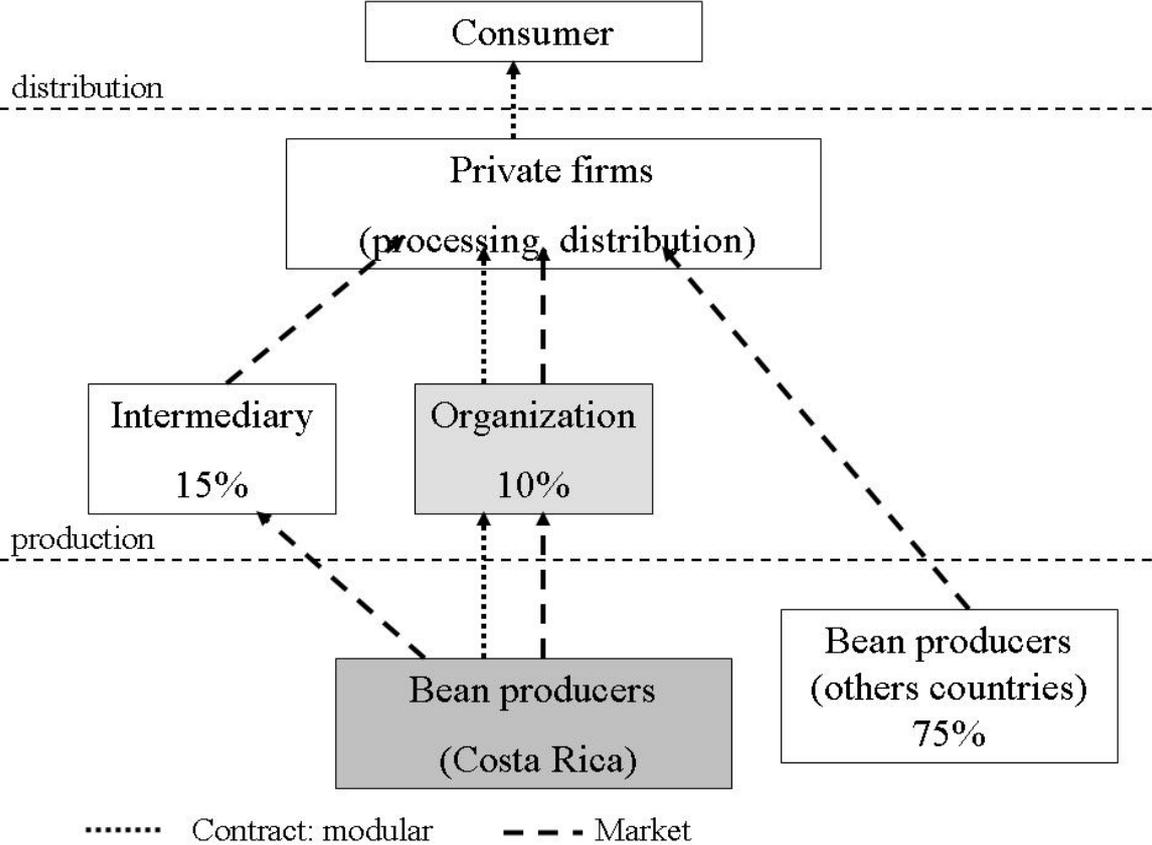
The coordination mechanisms of the bean sector considerably changed in the last years. Before 1994, the prevailing coordination mechanisms was a hierarchical one (State-run hierarchical coordination) as public institutions bought all the production at a fixed price (Salazar 2003). Since 1995, the coordination mechanisms are mainly “market” or secondly “hybrid”. This important shift has to be related with (i) State withdrawal from agricultural support to bean production in 1994 (Ruiz 2002) and to (ii) Costa Rica adhesion to World Trade Organization in 1994 and frontiers opening.

The nowadays the main coordination mechanisms, represented in the figure 2, are ruled by market between farmers and private firms or intermediaries. But Costa Rica only provides 23% of the consumption and others countries (Argentina and Nicaragua) provide 77% of the consumption. A national commission with farmers’ representatives, importers, and industrials regulates part of the importations to maintain national production.

But hybrid coordination appears as an alternative to market coordination. It takes place as annual based contracts or formal agreements between organizations and private firms of transformation and distribution. Those contracts or agreements aim at stabilizing the trade

relationships between the bean producers (and their organizations) and the private firms that are interested especially in (i) reducing transaction costs resulting from the research of bean providers during the short harvesting period and (ii) improve and control the product quality by specifying standards. This type of contract looks like “modular coordination” as it doesn’t entail a high level of specific assets. If this kind of coordination is an important one for small farmers since it reduces their marketing risks, it remains that it only represents a small part of the total market shares (less than 10%) but near the 40% of the national production (see figure 2).

Figure 2 : Coordination mechanisms in the bean sector



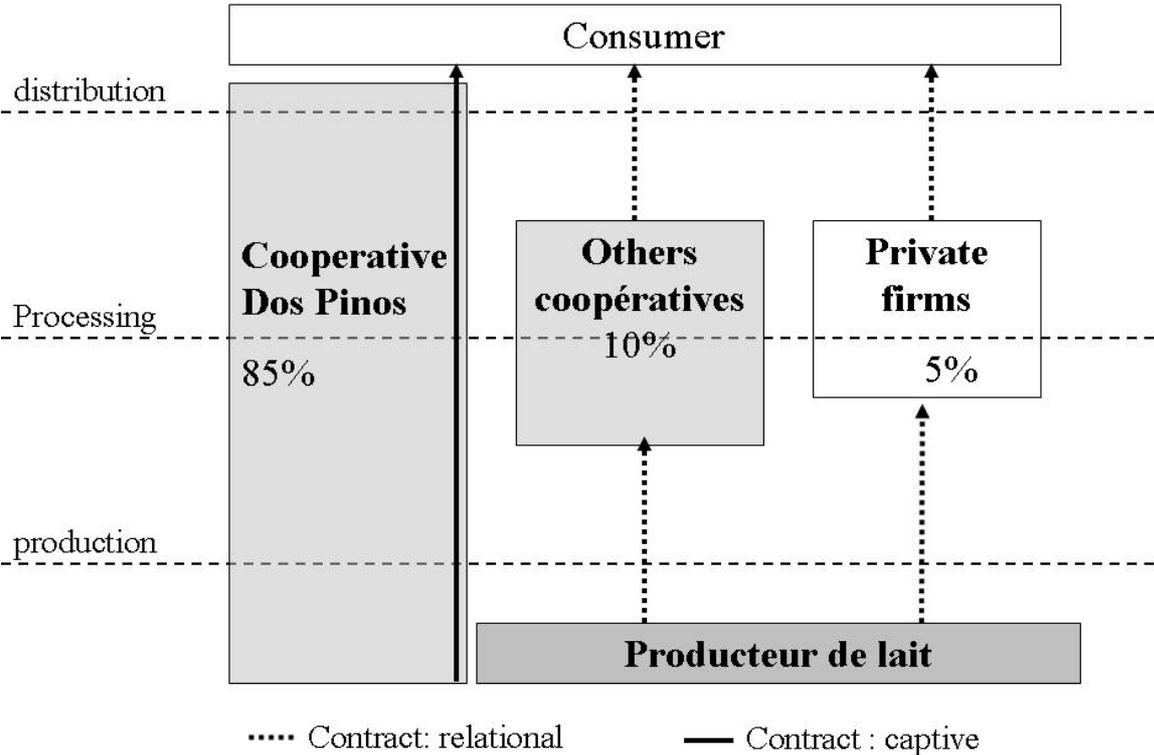
2.3 Milk sector

In the milk sector, the main form of coordination mechanisms is the contract but mainly based on “captive coordination” and “relational coordination” (figure 3). Those coordination mechanisms currently observed has been constituted around fifty years ago and depend on two different economical key actors. The first actor is CoopeDosPinos, a farmers’ cooperative that manage 85% of the domestic market share (Montero 2004). It is reinforcing its situation of quasi-monopole on the domestic market and is developing exportations towards central-american and north-american markets (Melendez and Gonzalez 1998). This cooperative has vertically integrated different functions of the supply chain (i) by buying all the milk to the farmers under strict technical specifications and by providing obligatory services, (ii) by managing manufactures to process the milk and (iii) by developing strong alliances to control the distribution activities. Inside the CoopeDosPinos the coordination mechanisms refer to “captive coordination”. Asset

specificity is very high as the farmers cannot easily shift from milk production to another activity; the contracts between the farmers and the cooperative include a control on the product and on the process (Hobbs 1996) with a high administrative control. Such a coordination mechanism provides protection for specific investments and is a relatively efficient one for responding to change where coordinated adaptation is necessary.

The second type of actor, are others private firms and other farmers’ organizations that collect and process milk under contractual mechanisms. Those actors refer to a market share of 15% (SEPSA 2002). In the case of private firms and farmers organizations, the coordination mechanism is a “hybrid” type with “relational coordination” between farmers and processors as farmers can shift from one processor to another but not easily from milk production to another production. In some cases long-term contracts are signed up between processors and farmers or retailers to decrease the commercial risks, in other cases informal agreements exist but trust is a strong incentive to maintain stable relationships.

Figure 3: Coordination mechanisms in the milk sector



2.4 Pineapple sector

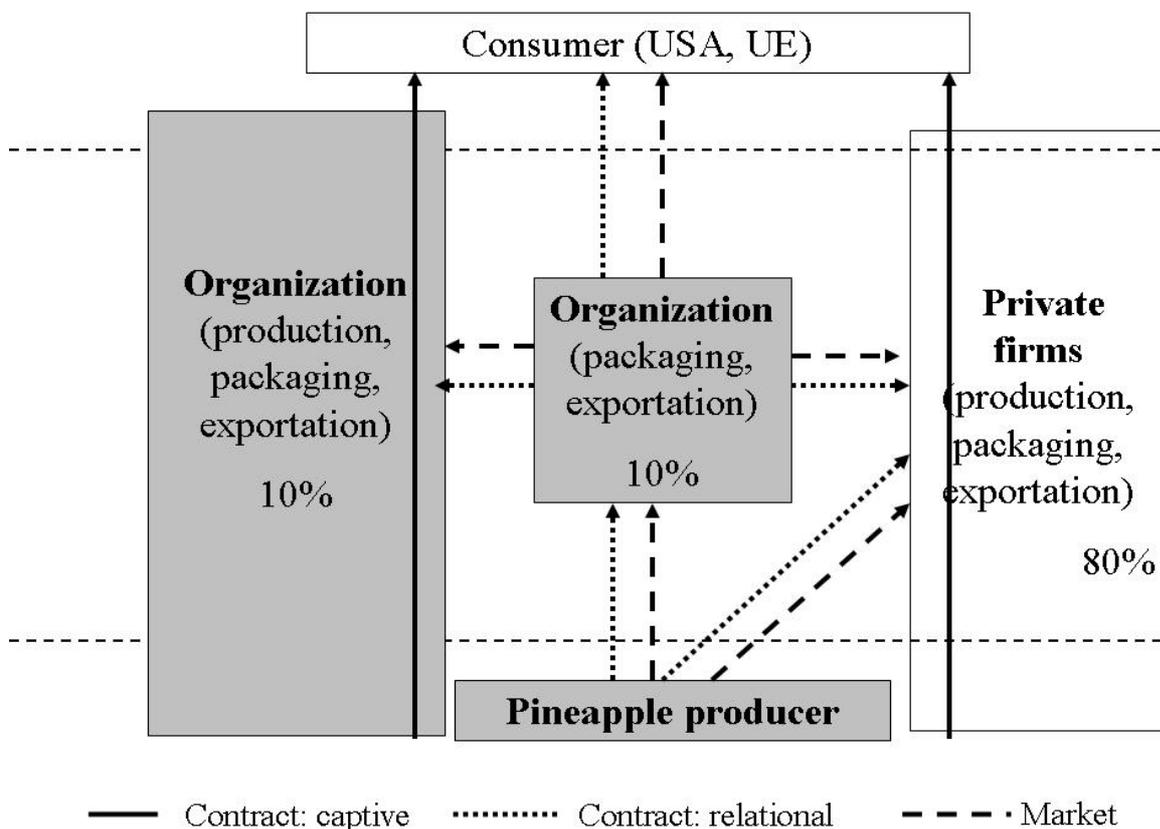
The pineapple sector is nowadays characterized by the co-existence of three different coordination mechanisms:

- Hierarchy coordination mechanisms correspond to national or international private firms installed in Costa Rica since the 90s (Quesada 1999) that integrated vertically the functions of production, packaging and distribution. Most of them only work on the export sector. These firms correspond to the highest market share (about 90%).

- Hybrid coordination mechanisms correspond (i) to farmers' organizations (represented as Organization 1 on the figure 4) that are progressively integrating toward packaging and exportations with "captive coordination" between the farmers' organization and the members because of a high level of specific assets and (ii) to others farmers' organizations (represented as Organization 2) that operate through formal contracting with farmers and with private firms of transformation and exportation (Chaves 2004). In this case the coordination mechanisms vary from "relational" to "captive" depending of the contract.
- Market structures correspond to some intermediaries that directly follow market opportunities. This kind of coordination can still be very fruitful, since pineapple market is very dynamic, and intermediaries are quick to adapt to changing circumstances with prices providing powerful incentives.

Currently there are no professional bodies to regulate the relationships between stakeholders but only an organization to represent the interest of the bigger producers.

Figure 4 : Coordination mechanisms in the pineapple sector



2.5 Synthesis

First, the analysis of coordination mechanisms shows a variety of situations among the sectors and inside each sector. As presented in the table 2, the variety of coordination mechanisms observed among sectors (hierarchy, hybrid with different levels, or market) can be explained in terms of transaction attributes in line with the transaction cost theory (Williamson, 1991; Menard, 2007).

The more the asset specificity increases, the more is developed the hierarchical coordination in the sector. In milk and pineapple sector were hierarchical and captive (hybrid) are the most developed mechanisms of coordination, the asset specificity is the highest. This is due to (1) the characteristics of the products and especially its perishability that asks for rapid and important processing (case of milk) or rapid packaging (case of pineapple); (2), the level of the standards which asks for high specific physical and human (both with well trained farmers and technicians with specific skills) investments at both production and processing level, to reach those high quality standards. This level of standards could results from (1) the marketing strategy of the leading actors of the sector (case of DosPinos cooperative and the development of its brand name) or (2) the demand of the final purchasers (case of pineapple sector and the necessity to comply with European and American standards - Eurepgap or bioterrorism act). On the contrary, in beef and bean sectors were the market or modular (hybrid) coordination dominates the asset specificity is low: the human and physical specific investments required as not so important since those products are storable and the quality standards requirement are low (no brand name strategy, low level of standards for national markets).

The uncertainty of the transaction is higher in the bean sector, where price evolutions and actors behaviors can hardly be anticipated. The price risk is low in the milk sector, intermediate in the pineapple (at least in the medium term with a strong demand in the international market) and beef sector (as the producers can delay their sells in case of conjectural price crisis). The commercial transactions take place all year round in the beef, milk and pineapple sectors. But farmers sell from time to time in the beef sector, regularly in the pineapple sector, every day in the mil sector. It only happens during some months in the bean sector.

This empirical analysis of the main governance structures confirms empirically the theory of transaction costs theory (Williamson, 1991). Nevertheless, it empirically suggests that the “asset specificity” is the more important key factor that influences coordination mechanisms in the sector.

Secondly, we saw that the current prevailing coordination mechanisms are not a static category: on the contrary, it appears that these mechanisms changed along the time. As illustrated in the table 3, the trends of evolution of the main coordination mechanisms could be researched trough the markets conditions, including especially: (1) the level and dynamic of the market demand, (2) the level (or intensity) and type of products specifications. This suggests that hierarchical coordination tends to be developed in dynamic market with high intensity of specification (case of milk and pineapple). In the case of stable market with little specification, the market coordination tends to be developed.

Table 2: Coordination mechanisms and transaction attributes

	Beef	Bean	Milk	Pineapple
Market conditions				
Level of the demand	+	+	++	++
Trend of the demand	Stable	Reducing	Increasing	Increasing
Asset specificity				
In general	Low	Low	High	Medium
Including standards at farm level:				
Stringency	Low	Medium	High	High
Based on	Product	Product	Product and process	Product and process
Uncertainty on price	Medium	High	Low	Medium
Frequency	Medium	Low	High	High
Coordination mechanisms	Mainly market Few modular	Market Modular	Mainly captive (<i>DosPinos</i>) Some relational	Mainly hierarchy (<i>private firms</i>) Captive Relational Some market
Trend of coordination mechanisms	Stable	Variable	Captive increasing	Hierarchy increasing

As the diversity and the trends of evolution of the main mechanisms of coordination among the different supply chain have been analyzed, we will now analyze the impact of the different coordination mechanisms and their evolution on the integration or the exclusion process of small farmers. .

3 Effects of the coordination mechanisms on small farmers and on their organizations

The coordination mechanisms have strong implications at farm level. Depending on their resources (labor, land, capital, capacities, etc.) but also on their perception of their situation, some farmers can adapt their farming systems to match the market requests and others shift to others activities or disappear. To be involved in a supply chain with specific requests implies to modify the farming system by buying specific inputs, investing in some specific equipment, or developing specific skills. It could be achieved through an intensification process, an increase of the farm size to make more profitable the investments, or/and a certain level of specialization. The dependency to one product with high specific investments could increase and generate more risks for the farmers in case of price crisis or misbehavior of one actor along the supply chain.

The coordination mechanisms generate strong implication at farmers' organization level too. The role and function of farmers' organization in commodity chain could be of different sorts even with market coordination mechanisms. By pooling individual economic resources, the farmers' organization can generate economy of scale through collective infrastructure or equipment. The farmers' organization can reduce information asymmetry between producers and other actors of the commodity chain through the development of efficient information system. By pooling individual production, the farmers' organization can increase producers bargaining power. Through advocacy, farmers' organization could

affect the institutional arrangements along the commodity chain or the institutional environment (laws, rules, etc.). In a context of increasing barriers to enter the market, some farmers' organizations have the capacities to answer the client's requests and others have to leave the sector depending on their resources, their experiences, but also their objectives which can encompass more activities, and the members' objectives. The farmers' organizations strategies can be different with a specialization in one product, an integration of different steps inside the supply chain, or a participation in the governance of the supply chain; they could also tend to diversify their activities to reduce marketing risks.

The case studies analysis provides some elements on the stakeholders' strategies and the consequences both at farm level and farmers' organization level.

3.1 *Beef sector*

The characteristics of the sector with (i) low risks for farmers to produce and sell the cattle all around the year, (ii) an efficient auction system which guarantee a fair price according to the market conditions, and (iii) not strict requests for quality generating unbearable technical specifications for some farmers, facilitate transactions through market coordination and the integration of small farmers. Beef production is a more secured production for them generating stable revenues along the year except when crisis occur on the international market. Small farmers often combine beef production with cheese production when large farmers generally have more specialized farming system. The level of revenues mainly depends on the size of the farm due to the existence of a single extensive farming system with low production costs per hectare or per animal. In this context of smooth market entry barriers for farmers, the number of small farmers involved in this supply chain rapidly increases without implying a strong degree of specialization at the production system level and with the maintaining of others productions for the familiar consumption or the market. Due to the modest added value generating per hectare through beef production and due to poor specific assets for beef production that enables more production system flexibility, some large farmers prefer to shift from beef production to others more profitable productions.

Due to relative efficient market coordination it seems that there is no need for strong farmers' organizations. The only ones which exist in the northern region are mainly dedicated to control and improve the auction system aimed at maintaining efficient market coordination. Only a few years ago the stakeholders involved in the supply chain decided to create an institutional body (CORFOGA) to participate more in public policies design, to improve the productivity at farm level, and to reinforce quality processes because of emergence of new requests on the international market about inocuity. This last point could drastically impact small farmers in the future.

3.2 *Bean sector*

In this sector the market is the dominant coordination mechanism in a context of strong competition with imported bean and low national farmers' competitiveness. This situation provokes a decrease of the incomes at farm level and drastically limits the capacity of the farmers to invest to improve their productivity and the quality of their product. They adopt a strategy of diversification of the productions at farm level (maize, rice, livestock, etc.) to be less dependent from the bean production and even a lot of them abandon the sector. Only large scale farms continue to regularly produce bean as they had invested in

mechanization in the past and they have some livestock to diversify the incomes and balance the risk related to the bean production.

With a product that farmers can store for months to wait for better price and with the presence of numerous buyers (firms or intermediaries) offering different opportunities to sell, the coordination between farmers through farmers' organizations is quite difficult. A lot of opportunistic behaviors (especially free riding, Olson 1978) occurs impeding strengthening them to set-up a collective action. To limit the risks run by all the stakeholders some contracts are established between farmers' organizations and buyers. From the farmers' organizations point of view they are aimed at to guarantee the outlets and therefore to secure the farmers for investing in bean production. From the buyers' point of view they are aimed at limiting the transaction costs generating by individual contracts and the scattered availability of product (assembly costs), controlling better the quality of the product, and managing a regular sourcing. Nevertheless, it should be notice that this interest of the buyers comes only because the importations are temporarily limited by State rules during the harvesting period.

To conclude, the problem of the inclusion of small farmers seems to depend more on other factors than the type of coordination mechanisms. But it appears that the market coordination which can occur due to the sector characteristics don't facilitate the emergence of strong farmers' organizations.

3.3 Milk sector

The needs (i) for farmers to sell rapidly the milk to avoid conservation problems and make profitable and secure the specific investments, (ii) for the industrial to guarantee regular milk supply to limit the risk related to high investments and to strictly control the quality of the product along the different steps, generate a coordination near the hierarchy ("captive coordination") with strict and well defined rules between farmers and farmers' organization or between farmers and the private sector to control the production process and define the payments arrangements.

To face the technical specifications the farmers have to develop a specialized farming system highly intensified with inputs partially provided by the cooperative and with special equipment dealing with milking and feed operations. In such a framework the incomes are stable and the milk price relatively attractive but with high production costs. Not all the farmers are able to access to the industrialized milk sector (1380 producers at the national level) due to the level of the required investments and the barriers to entry the supply chain (entry costs, specific skills, etc.). Thus the majority of the small farmers remains in local market producing local cheese. Not all the farmers involved in the industrialized milk sector are able to adapt their farming system to ever stricter rules. Some of them progressively disappear from this sector and some others establish new relationships with others farmers' organizations or private firms based on less stricter rules but usually with a lower price.

For the farmers' organizations or for the private firms the control on the design of the rules and the management of the milk supply area are critical. The need for strong coordination is a key reason explaining (i) the raise of strong farmers' organizations competing with private firms, and (ii) the long tradition of the farmers' organizations to negotiate with the State adequate public policies for the sector. But in fact DosPinos Cooperative acts more

and more as a private firm with a currently weak influence of the farmers in governance as the profitability of the industrial investment becomes one of the main criteria for the decision-making process.

3.4 *Pineapple sector*

Due to (i) strict technical specification for exporting pineapple including a traceability system and a certification process to access to some markets in Europe, (ii) very high production costs related to intensive agricultural techniques required (iii) the importance of regularity of delivery of the products, hierarchy is the dominant governance structure in the pineapple structure. Transnational firms or private national firms prefer to produce a large part of the production they need, and after to process and export it, to reduce the risks related to an inadequate quality and the transaction costs related to contract managing. But to answer to the market needs, they often negotiate long term contract with a few set of medium or large scale farmers to obtain an additional pineapple production with strict rules dealing with quality, volume, planning, and production process. Because of attractive price on the market this type of farmers is significantly increasing. For the same reasons of the big firms the farmers involved in pineapple production have to be specialized in one production.

The small farmers produce pineapple for the national market for a long time. But the strict technical specification for exportation and the need to gather production from different farmers to answer the clients' requests generate the creation of new and stronger farmers' organizations. In this case the coordination between the farmers and the farmers' organization must be well tailored to obtain the quantity and the quality at the right time and to determine the payment modalities based on quality. The fact that (i) farmers can escape from the contract with the organization because of the existence of others market opportunities, and (ii) the real difficulty to export directly without intermediaries (private firms, transnational, etc.) because all the requests along the chain, limit the farmers' organization development. The coordination between the farmers' organizations and the clients has to be well defined too but could be more flexible as the farmers' organizations have different options (captive relationships with a private firm based on long term contract, relational relationships with short term contracts). The nature of the contract could have an effect on the inclusion or exclusion of the small farmers. As the international prices are attractive the number of small farmers involved in exportation lightly increases even with a high level of entry barriers due to high production costs. But if the certification to export to Europe (one of the main client) becomes a strong request a large exclusion process could be observed as the certification costs are unaffordable and the requests unachievable for small farmers.

3.5 *Sintesis*

The following tables synthesize the results.

Table 3: Effects of the different types of coordination mechanisms on farmers.

Supply chain		Beef	Bean	Milk	Pineapple
Main coordination mechanisms		Mainly market Few modular	Market Modular	Mainly captive Some relational	Mainly hierarchy Captive Relational Some market
Farmers' strategies	Degree of specialization	Low for small farm High for large farm	Low	High	High
	Degree of intensification	Low	Low for small farm Medium for large farm	High	High
Effects on farmers	Current integration of small farmers	Yes	Yes (decreasing)	Low (decreasing)	Low (increasing)
	Current evolution of farmers - Small farm - Large farm	++ -	- - -	-- -	+ ++
	Risk of exclusion of farmers	Low	High for small farm Medium for large farm	High for small farm Low for large farm	High for small farm Medium for large farm
	Stability of revenues	Yes But some cyclical crises	No High price variability	Yes	Yes High market price
	Farm size	10-500 ha Decreasing	5-100 ha Stable	10-100 ha Increasing	5-50 ha Increasing

Table 4: Effects of different types of coordination mechanisms on farmers' organizations

Supply chain		Beef	Bean	Milk	Pineapple
Farmers' organizations strategies	Specialization	Not relevant	No	Yes	Yes
	Integration of function in the supply chain	Not relevant	Low	High	Some recent attempts for packaging
	Coordination with farmers	Not relevant	Weak	Strong	Strong for exportation sector Medium for national market
	Coordination with others stakeholders	Not relevant	Medium in case of contracts Weak in others cases	Medium (mainly with supermarkets)	Strong for exportation Weak for national market
	Participation in supply chain governance	Yes but recent	Some recent attempts	Yes for a long time	Not relevant
Effects on farmers' organizations	Number of FO's	Low	-	+	++
	Market share of FO's	0%	10 % Declining	95 %	5 % Raising
	Risk management at FO's level	Not relevant	Low	High	Medium

It is important to mention that coordination mechanisms are not sufficient to explain the inclusion or exclusion process of farmers. The demand and the price of the product remain key drivers for shaping the supply chain. But what are the implications for farmers and farmer's organizations of different coordination mechanisms inside the supply chain?

Hybrid with "captive coordination" can be an opportunity for farmers to participate in supply chain with strict technical specifications, costly specific investments, and/or high

risks. The results show two alternatives. First farmers can set-up their own farmers' organization to vertically integrate the sector as in the milk sector case. But it requires strong capacities to design adequate rules between farmers and the farmers' organization, to manage the industrial investments, and to negotiate with others stakeholders. This coordination mechanism could lead to a small farmers' exclusion process but partially controlled by the farmers themselves. Building a strong farmers' organization requires a long time (20 years in the case of the Dos Pinos cooperative) which was possible a few decades ago in a more stable institutional environment. Will new farmers' organizations in others sectors have time to follow the same path in the current rapidly changing environment? Second the integration could be under the control of a private firm which controls all the process through strict contracts. In this framework only a few large scale farmers are able participate in the supply chain with high risks of exit in case of crisis in the sector. The internal policy of the private firm may mitigate the scope of exclusion as social standards could be more or less important.

Other hybrid coordination may be a good opportunity to favor smallholder farmers' inclusion. There are encouraging experiences in the case of the bean sector with farmers' organizations collecting and selling farmers' product and with annual contracts between farmers' organizations and private firms which directly supply supermarkets. In the case of the pineapple sector, some strong farmers' organizations are able to facilitate access to market for smallholders even with strict technical specifications for exported product. The rules regulating the coordination mechanisms must be well designed between the farmers and the farmers' organization and/or between the farmers' organization and the clients. But hybrid coordination enables some flexibility for defining rules between stakeholders that gives more time and more diversified solutions for facilitating the farming system adaptation of the small farmers to meet the evolving market requests.

Market governance could be an inclusive mechanism for small farmers if the technical specifications are smooth and with efficient and transparent mechanism as auction system in the case of the beef sector. In this situation there is little need for strong farmers' organizations as farmers can easily sell their products without promoting a collective action. Farmers' organizations are devoted to participate in the auction system management and to defend their interests at a policy level as well as promote technical innovations that enable to reduce production costs and increase quality.

The key point is the farmers' organization capacity for really participating in the supply chain. This depends on the characteristics of the product and the supply chain, and the human and financial resources the farmers' organization can mobilize. Farmers can influence the rules of the game at the farmers' organization level depending on its negotiation power. But taking into account asymmetric relationships between the stakeholders, its capacity to influence the rules is usually weak. Farmers' influence could increase through unions between farmers' organizations or through professional bodies as in the case of the bean sector.

If the diversity of main mechanisms among the different supply chain has been partially explained, the variability inside a sector still requires to be further analyzed, it could play an important role in integration of small farmers to the commodity chain.

4 Conclusion

The paper indicates that small holders' integration inside supply chains largely depends on the type of coordination mechanisms. In the case of low technical specifications and adequate and transparent selling mechanisms, the market coordination could be efficient to improve small farmers' inclusion. However, in the case of high technical specifications by downstream stakeholders, production and transaction costs raise and as a result there is a need for more secured relationships. Hybrid coordination through "captive coordination" could be an alternative for larger farmers which can afford costly investments but tend to be a selective process that lead to a strong exclusion of small farmers. Contract farming through "relational coordination" or "modular coordination", as an intermediary coordination mechanism, represents an opportunity for inclusion, enabling farmers to enter in the necessary learning process. In this case the intensity of the inclusion process largely depends on the capacity of the farmers' organizations to negotiate adequate contracts and to bring relevant services to their members especially in order to help them to comply with standards and market requests. But it also depends on public policies for providing an enabling environment for farmers' organizations.

Thus, the capability of farmers' organizations to negotiate contracts with others stakeholders and to monitor them, is a key factor of organizations' development and small holders' market integration. It claims for higher public investments to strengthen farmers' organizations through adequate trainings and assistance. It claims also for the strengthening of the dialogue between farmers' organizations and the State to develop innovative services mechanisms and public policies that facilitate their market integration.

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