Seasoning a monopsonic processor for collective action amongst pepper producers in Costa Rica

Fernando J.F. Sáenz-Segura [a,b*], Robert A. Schipper [b] and Marijke F.C. D'Haese [b]

a: Universidad Nacional, International Centre of Economic Policy Research for Sustainable Development (CINPE), P.O. Box 555-3000 Heredia, Costa Rica. Tel.+506-2634550; fax. +506-2601270. E-mail: fsaenz@una.ac.cr

b: Wageningen University, Department of Social Sciences, Development Economics Group, Hollandseweg 1, 6706 KN Wageningen, The Netherlands, E-mail: Rob.Schipper@wur.nl and Marijke.Dhaese@wur.nl

* Corresponding author: fsaenz@una.ac.cr

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1. Introduction

We present a case study on contracts in pepper production (*peper nigrum* L.) in Costa Rica. There are no spot markets for pepper in Costa Rica and only one single processor buys fresh pepper from producers and thereby selects only bunches with the best quality. Most farmers deliver pepper individually to the processor. In this monopsonic market, rejection rates average 10% of each delivery, which results in important income losses for farmers. Pepper is rejected when it has been damaged during transport or it was picked in an immature state. Farmers are in a weak position to negotiate and the rates of rejection are a source of distrust between the farmers and the processor. In response, farmers from the settlement *El Roble* started to organize pepper selection and transport themselves, and bulk the pepper transactions into a single group contract. The activities of the association have the dual aim of reducing rejection rates and increasing the bargaining power in price negotiations, i.e. negotiation of a group contract.

Mainstream economics predicts that the buyer of pepper would resist the initiation of an association as it limits its influence on the pepper price. In an economy where transaction costs are ignored, a monopsonic firm would have full power to dictate price and quantity to maximise profits depending on its own cost structure and marginal product. In a group contract arrangement the firm could loose these prerogatives because the new market arrangement has the characteristics of a bilateral monopoly. Yet, on the other hand, individual contracts are expensive to implement. Comparable to a spot market, individual contracts give rise to high search, monitoring and enforcement costs which make the contracts *'costly, cumbersome, time-consuming and unpredictable'* (Fafchamps, 2004). The level of these transaction costs are determined by uncertainty (positive) and frequency (negative) of the transaction and the degree of specific investment involved (positive) (Williamson in Ménard, 2005).

The uncertainty in the trade of fresh pepper is important since it is a perishable product with variable quality. Two important sources of uncertainty are opportunistic behaviour of both producers and firm, and bounded rationality. Opportunistic behaviour refers to the possibility of agents to act out of self-interest. Bounded rationality refers to the physically-limited capacity of agents to evaluate accurately all potential gains and losses from a given market decision, like a contractual choice (Simon, 1961). Due to bounded rationality complete contracts do not exist; this usually encourages agents to act opportunistically and to take advantage of any situation that has not been specified in the contract. The producers will try to maximize their sales and thereby offer all pepper harvested, disregarding the quality levels. Furthermore, farmers are found to easily breach individual contracts. Enforcement is problematic as the contracts are informal and small in quantity and therefore beyond the reach of the law. Moreover, even if the producers would be prosecuted for breaching a contract, they have little assets that could be seized (cf. contracts by African traders in Fafchamps (2004)). The frequency of transaction is high because pepper is harvested throughout the year and sales are organised every two weeks. During the low production season, the frequency of transaction may drop to one delivery per three weeks. This would indicate that reputation is important. Finally, asset specificity[1] is high for both producers and processors. This specificity usually affects the balance of bargaining power between the processor and smallholders, and makes a processor often less interested to be integrated with the production side.

Williamson (1991) explained how trading agents search for the best mode of governance that fits the characteristics of the transaction in order to minimize transaction costs. We argue that the group contract results in economics of scale for contracting and other transaction costs as well as the improvement of product coordination to ensure a regular provision of fresh pepper with the desired quality characteristics (Singh, 2000; Glover 1987). A group contract is considered as a hybrid governance arrangement that reduces transaction costs (Ménard, 2004; Allen and Lueck, 2005; Ménard, 2005). Efficiency gains from a group contract can also be explained from an agency theory view. A group contract is considered as a more efficient way to govern the relationship between the principal (i.e. processor) and the agents (i.e. producers individually and/or as a farmers' association), because it reduces the conflicts of self-interest between the principal and the agent(s). Next to scale economies in contracting costs, it is assumed that a group contract overcomes the agency problem that results from the opportunistic behaviour of both regarding the quality and rejection of fresh pepper (Eisenhardt, 1989). Thus, a group

[1] Asset specificity means high specialization of investments for a near unique commercial purpose (Williamson, 1991; Hobbs, 1996; Key and Runsten, 1999).

contract may limit the effects of the skewed bargaining power that results from the monopsonic market power of the processor (cf. cooperatives that have contractual purposes to deal with perceived market failures (Cook, 1995)), and bargaining cooperatives described by Knoeber (1983) as collective organizations to contract with processors for the sale of members' crops). Furthermore, the farmers' association may have external economies, also described as passive collective efficiency (Nadvi in McDormick (1999)) such as improved access to market information and labour pooling in sorting, packaging, supervision and transport.

The purpose of this paper is to demonstrate that we can find conditions for which the incomes of the monopsonic processing firm and the farmers' association are jointly maximized by a group contract. The focus of the study is on farmers from the *El Roble* peasant settlement, because they started a producers' organization in response to a monopsonistic market. We identified 19 members at the time of the research. Based on survey information of these farmers, we developed a model to calculate the benefits from behaviour and contract choices.

This study is innovative in the calculation of the results in price and income from firm and farmers' behaviour. The model is built on real data concerning production and marketing costs. Following this introduction, we give the specifications of our optimisation model, followed by a description of the main outcomes in section three. We conclude in section four.

2. Model specification

2.1 Conceptual framework

A non-linear integer simulation model was set-up to assess the contractual agreement that maximizes the processor's and farmers' gross income. The model is adapted from Dorward (2001). The sum of the gross incomes[2] of the farmers and processor is maximized, taking into account their relative market power and

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[2] Gross income is defined as value of sales less value of variable and fixed costs, not including labor, capital and land costs.

risk preferences. In the model individual farmers (*sellers*) sell pepper to one single monopsonic processor (*buyer*). Mature pepper plants are harvested throughout the year, yet with a clear harvesting peak resulting in two marketing seasons (s): low-supply (March to November) and high supply (December to February). The contractual forms (k) are individual contracts (IC) and group contracts (GC). The processor and farmers may behave low or high opportunistically (j) to which probabilities of occurrence and expected losses are associated. It is assumed for a given party, that high probabilities are attributed to other party's high opportunistic behaviour in individual contracts, and high probabilities to low opportunistic behaviour of the other party in group contracts. It is expected that rejection rates and supervision costs are highest under high opportunistic behaviour of farmer and processor. We also assume that the firm's production costs are lower under group contracts as the fresh pepper is of better quality, with the lowest costs when opportunistic behaviour is low.

The model calculates the income levels of farm and firm with the quantity transacted and price of fresh pepper as endogenous variables in the model. The incomes should at least be equal than a reservation income that firm and farmers could gain in alternative activities. Furthermore, risk behaviour is modelled using a Target MOTAD approach (Tauer, 1983). In such model, income deviations below a target income should be smaller than parameters ('lambdas') for farmers and firm which reflect their respective risk aversion. Low levels of both lambdas indicate that buyer or seller is risk averse regarding such income deviations.

When individual contracts are set up, monopsonistic market conditions prevail as the firm (buyer) has full market power, i.e. he can set the buying price for fresh pepper according to the value of its marginal product (Henderson & Quandt, 1980). In the case of collective action, a bilateral monopoly emerges, i.e. one buyer and one group of sellers. It is useful to consider three sub-cases, as the price of pepper will be the result of negotiations between the buyer and the seller. The three cases are two limiting cases; a monopoly where the farmers' group would have all market power and a monopsony (buyer firm has all market power), and an in-between case of joint profit maximization (Henderson & Quandt, 1980) as a possible, but not necessary outcome, of a negotiation process.

2.2 Data

The model uses data from a previous research in markets and contracts for smallholder pepper producers in Costa Rica (Ruben and Sáenz, forthcoming). Data were gathered in 2000 and 2001 from farmers' surveys and in-depth interviews with processors and employees of involved governmental institutions. Because the identity and number of the producers were unknown at the beginning of the research, we implemented a non-random sampling method, called 'snow ball' method (Babbie 1992)[3]. We chose the *El Roble* settlement because it is oldest as a pepper producing area and the main producing area in Costa Rica in 2000. It has the most skilled pepper producers and is the only area with a producers' organization.

The selected 19 producers from *El Roble* settlement devote on average 1.32 manzanas (mz)[4] to pepper, which is on average 4.5% of their available land. Further increase in the area of pepper would depend on labor availability, available capital for investment and the farmers' confidence in the market conditions. These producers have additional income sources apart from pepper with 58% (or 11 cases) reporting that less than 40% of their income is earned from pepper. Other income sources include animal husbandry and non-agricultural activities.

2.3 Model specifications

In the model, we consider two market conditions (s): low and high supply seasons; two contract arrangements (k): individual and group contracts (IC and GC, respectively); and the parties may display a low or high opportunistic behaviour (j) (low-opp and high-opp, respectively). Model specification is as follows:

Objective function:

$$Max \quad A = \sum_{kjs} w_{kj} B_{kjs}\, pb_{kjs} + \sum_{kjs} (1 - w_{kj}) S_{kjs}\, ps_{kjs} \qquad (1)$$

[3] We identified 75 active pepper producers and successfully interviewed 65, of which 19 from *El Roble* settlement.
[4] 1 manzana equals 7.000 m^2 or 0.7 ha.

Gross Income calculation:

$$B_{kjs} = X_{kjs}(1 - refuse_{kjs}) / indy) frp - \\ X_{kjs}(1 - refuse_{kjs})(F_{kjs} + premium_k + fpc_{ks} / indy + ft_{ks} + fg_{ks}) - ff_{ks}, \quad \forall k, j \tag{2}$$

$$S_{kjs} = X_{kjs}(1 - refuse_{kjs})(F_{kjs} + premium_k) \\ - X_{kjs}(ppc_{ks} + pg_{kjs} + pt_{kjs} + pts_{kjs} + pmf_k) - pf_{ks}, \quad \forall k, j \tag{3}$$

Minimum income requirements per season:

$$\sum_{kj} B_{kjs} pb_{kjs} \geq rb_s, \quad \forall s \tag{4}$$

$$\sum_{kj} S_{kjs} ps_{kjs} \geq rs_s, \quad \forall s \tag{5}$$

Target MOTAD part:

$$\sum_{s} (B_{kjs} + Zb^{-}_{kjs}) \geq b^*, \quad \forall k, j \tag{6}$$

$$\sum_{s} (S_{kjs} + Zs^{-}_{kjs}) \geq s^*, \quad \forall k, j \tag{7}$$

$$\sum_{kjs} pb_{kjs} Zb^{-}_{kjs} = \lambda_{buyer} \tag{8}$$

$$\sum_{kjs} ps_{kjs} Zs^{-}_{kjs} = \lambda_{seller} \tag{9}$$

Capacity restriction:

$$\sum_{kj} X_{kjs} \leq cap * qs_s, \quad \forall s \tag{10}$$

Binary part of the model:

$$X_{kjs} > m * Y_{kjs}, \quad \forall k, j, s \tag{11}$$

$$\sum_{kj} Y_{kjs} < 1, \quad \forall s \tag{12}$$

In the objective function (1), the sum of the gross income of processor and farmers is maximized. This is expressed as the expected income of processor (B) and farmers (S) multiplied by their bargaining power. The w is defined as a measure of bargaining power of the processor with respect to the farmers with a value ranging from 0 to 1 ($0 \leq w \leq 1$). If w = 0 farmers take all the gains and if w = 1 the processor obtains all benefits, subject to minimum income requirements and risk considerations of the other party. We consider for the IC that w=1 in all cases. As explained above, we distinguish three market conditions for the GC namely, monopoly (w=0), monopsony (w=1) and joint profit maximization (w=0.5). The variables pb_{kjs} and ps_{kjs} measure the probability for a given party (processor or farmers) of other party's opportunistic behaviour (j), under contractual arrangement (k) and market condition (s). Probabilities sum one for each market condition (s). The probability for farmers behaving opportunistically is higher when the processor chooses individual contracts and lower when group contracts are chosen. The probability for the processor behaving opportunistically is higher when farmers choose individual contracts and lower when they choose group contracts.

Equations (2) and (3) show the endogenous determined income of the processor and farmers, respectively, under contractual arrangement (k), opportunistic behaviour (j) and season (s), by taking into account:

1. X_{kjs}: the endogenously determined volume of fresh pepper traded;
2. Rejection rate which is defined at four levels as follows: 9% (IC and low-opp), 15% (IC and high-opp), 1% (GC and low-opp), and 5% (GC and high-opp);
3. indy: the industrial yield and is defined by the processor as 4.20 kg of fresh pepper to produce 1 kg of processed white pepper;
4. frp_{ks}: processor's price for white pepper, equal to \$8 per kg. This is the highest selling price reported by the processor in 2000. Selling prices may vary every semester, according to negotiations with the processor's main client (a North American food processor based in Costa Rica). This niche market arrangement is relatively isolated from the world pepper market;

5 F_{kjs}: Purchase price of fresh pepper for the processor and the farmers is determined endogenously in the model; $premium_k$ is a quality premium paid as an incentive for good quality pepper in the group contract;

6 fpc_{kjs} and ppc_{ks}: the production costs for the processor and the farmers, respectively. The processor reported different production costs per kg of white pepper under k and j. The farmers survey estimated the average production costs at $0.17 per kg of fresh pepper;

7 fg_{ks}, ft_{ks}, pg_{ks}, pt_{ks}, pts_{ks} and pmf_k: organization costs when individual and group contracts are chosen; fg_{ks} and ft_{ks} are the coordination and transport costs for the processor per kg of fresh pepper under k and s; pg_{kjs} is the cost for farmers to organize supervision at the collection point, estimated at $0.107 per kg of fresh pepper for the supervision by 3 people during 3 hours at each delivery in low supply season; and $0.025 per kg for supervision by 3 people during 6 hours at each delivery in high supply season; pt_{kjs} is the cost of transportation from El Roble to the processor's processing facility and is estimated at $0.0204 per kg of fresh pepper in a 2.5 ton truck; pts_{kjs} are the costs of supervising the transportation, estimated at $0.024 per kg of fresh, given a processor's low opportunistic behaviour; and $0.0032 per kg under processor's high opportunistic behaviour[5,6]. pmf_k introduces a membership fee when group contracts are chosen;

8 ff_{ks} and pf_{ks}: fixed costs for the processor and the farmers when they trade pepper respectively. For the farmers this is the minimal cost of delivering and referring to the value of working time and the time needed for delivery at the collection point. For the processor we consider half of the monthly administrative costs for the management for processing pepper.

Equations (4) and (5) express that the expected gross income of processor and farmers should be larger than a reservation income which is equal to what they could have earned in an alternative activity in both

[5] We estimated the cost of one person travelling in the truck on every delivering, spending six hours for the trip and supervision at the processor's facility gate under processor's low opportunistic behaviour, and eight hours under processor's high opportunistic behaviour.
[6] Governance and transport supervision costs are calculated taking into account the minimum labour cost for an agricultural worker, which was about US$1 per hour at the time of this research.

seasons of the year. For the processor (rb) this is defined as half of the target income, namely (US) \$19,400, equally divided over each season. For the farmers (rs) it is defined as the average income obtained from other agricultural activities (commercial crops, livestock production and off-farm employment) amounting to \$17,570, divided over the two seasons.

The variables Zb^{-}_{kjs} and Zs^{-}_{kjs} in equations (6) to (9) determine the value of the deviation in income below the target income. The expected shortfall from the target is calculated. The satisfactory level of shortfall from target is given by λ_{buyer} and λ_{seller} for the processor and farmers respectively. These variables are introduced to let the model account for risk behaviour. For the processor, the target income (b*) is set at \$38,000 in the base run, which is the annual fixed costs to operate the plant processing pepper. For the farmers' group, target income (s*) is the lowest income they reported to be willing to accept before quitting to produce pepper, calculated at \$27,412 per year from survey data

Equation (10) refers to the limitations in production, namely that the amount of fresh pepper traded in a season should be lower than a maximum of what is transacted per season (30,000 kg, the production in 2000) multiplied by a capacity factor (cap) to allow for production increases.

Finally, constraints (11) and (12) are added to make the model integer, so that only one contract arrangement per season is selected. Thus, the model does not foresee the scenario where farmers trade part of the produce individually and the rest in a group contract. This set of equations was programmed in GAMS. The results are shown and discussed in the next section.

3. Results

As mentioned above, the model is run under three distinct market forms in group contract ((A) a monopsony of the processor; (B) joint profit maximisation between the processor and the farmers' association; and (C) a monopoly of farmers' association) by setting the parameter for market power (w) at values 1, 0.5 and 0, respectively (see section 2.3). In case of individual contracts, a monopsonistic situation prevails and the firm holds all bargaining power.

In all runs, a maximal amount of 60,000 kg of fresh pepper will be transacted for each season.

Table 1 shows the endogenously-calculated price at which fresh pepper is traded and the contract choice for the three runs. All prices are above the minimum price accepted by the producers, before they shift from pepper to another economic activity. At the time of research, the reported minimum price was on average $0.523/ kg of fresh pepper.

<Insert Table 1>

Table 2 shows the income levels that would be reached if the firm and farmers opt for the contract structure as proposed by the model above. It is clear that the firms' gains are the highest when it has a monopsonistic power and lowest in a monopoly situation, while for farmers is the opposite situation.

<Insert Table 2>

The model predicts that, given the parameters defined above, both firm and farmers as a group could benefit from developing a group contract in the limited cases, runs of monopsony (A) and monopoly (C). Although in a monopsony the processor has the bargaining power to keep the price of the fresh pepper low, the model, nevertheless, predicts that the gross income of the processor is maximized when the fresh pepper is procured in a group contract instead of a multiple set of smaller individual contracts.

In the other extreme case (C), when farmers are given all the bargaining power, a group contract is chosen at a higher selling price of pepper in both seasons. The gross income of the farmers is maximized at these higher prices. In this situation the costs of organizing a farmers' association and the costs to organise a group contract are lower than the benefits (mainly a lower rejection rate).

Limited case runs of monopsony (A) and monopoly (C) show the same outcome, namely that group contracts with low opportunistic behaviour yield the highest gross incomes for the firm and the farmers. The highest income levels for the firm and the lowest for the farmers are reached in the monopsony run (A), while the opposite is shown in a monopoly (C).

In the joint profit maximization run (B) it seems more rewarding for the processor to procure pepper in a group contract during the high season (at a price which is little higher than in monopsonistic run), and in individual contracts during the low season. In the latter case, the model predicts that the most optimal situation is reached at lower procurement prices than those paid in group contracts, and therefore being more favourable for the firm. The price paid to the farmers would be $0.681/kg of fresh pepper, above the average minimum price accepted by the farmers ($0.523/kg of fresh pepper). The model shows that the gains for the firm to organise a group contract (lower contract and transaction costs) are foregone by the loss in bargaining power which would result in a higher input price. The firm has enough bargaining power in the model to shift the contract choice into its favour.

The firm can maximize its income by acting opportunistically and exerting its monopsonic power in individual contracts. Yet it does so by paying a price which guarantees the farmers a minimal income, and without taking them to the point that they shift from pepper to another economic activity. The rational behind this opportunistic behaviour can be explained by the combined effects of the uncertainty of a constant flow of inputs and by the low frequency of transaction. As explained in the introduction, both uncertainty and frequency of transaction are determinants of transaction costs; and the level of transaction costs characterise to a large extend the governance structure between trading parties (Williamson, 2003).

The firm invested significantly in specific assets, more in particular in a processing plant and personnel, and it depends on farmers' loyalty, providing a constant flow of fresh pepper. During the low production season, however, the delivery of fresh pepper is more irregular (every 2 to 3 weeks instead of the weekly supply during the high season). In this case the firm may not run the risk that farmers refuse harvesting pepper and turn to other activities, which explains why the price of pepper reaches acceptable levels for the individual farmers. Farmers have some room for negotiation. Yet, it may not convince them to form an association and bulk the produce. The model shows that the gains for the firm of a lower procurement price are more important than the potential gains for the farmers of a higher selling price and a decrease of transaction costs. The transaction costs are high due the less frequent deliveries in the low season which encourages the agents to behave opportunistically. The reduction of these transaction costs that would result from a group contract is not sufficient to conduce to a collective action.

Conversely, the model predicts a group contract during the high season. This finding is in line with theory, namely that as the frequency of transaction increases, the risk on opportunistic behaviour decreases (Hobbs, 1996). Stable relationships are more easily maintained with high repeated transactions, where agents are able to build up reputation, loyalty and confidence. Or in other words, it is worthwhile for the firm to enter into a group contract in order to economize on transaction costs.

One could argue that a similar reasoning applies to the low supply market situation in the first scenario (A), as the firm faces similar low supply and uncertainty. Yet in the monopsonistic situation the objective function maximises the gross income of the firm as a sum of the returns in the low and high season. The income of the farmers is not considered, as we assume that they have no or very little bargaining power (although the firm seeks the farmers' loyalty, see above). In this case the firm exerts it bargaining power to conclude a group contract in the high supply season at a lower price of fresh pepper than in the low supply season.

4. Conclusions

The analysis demonstrates that under certain conditions the incomes of the monopsonic processing firm and the farmers' association are jointly maximized by a group contract, characterized by low opportunistic behaviour from both agents. The model shows that the firm is better off dealing with a group contract instead of a multiple set of smaller individual contracts while showing a low opportunistic behaviour; also in the monopsonistic market situation.

Runs (A) and (C) are limiting solutions. In the former case we would not expect a processor to behave as a total monopsonist. According to Key and Runsten (1999), if a monopsonic firm exerts all its bargaining power for its own benefit, it faces uncertainty regarding farmers' response, which is costly to monitor. Although farmers tend to be loyal to the processor, even if their negotiation power is limited, they might be forced out of pepper production if the price is found too low. They would earn a better living in alternative activities. This would be critical to the firm as it needs a continuous and stable flow to operate and remit its investments. Regarding run (C), pepper producers can form (and are forming) an organization in order to face the monopsony. However, they are very far from exerting a full monopolistic power due to their socio-economic limitations. Hence, we conclude that joint profit maximization run (B) is the most plausible solution for this case. The results of the model in run B have shown that the firm maximises its gross income in individual contracts; yet, it may not take the farmers for granted and pay them an unacceptable low price. This could further contribute to the farmers' loyalty (Key and Runsten, 1999).

The latter outcome is important in the sense that collective action might be needed only under certain market conditions, but not all the time. Given the importance of contract farming and collective actions as strong mechanisms to mitigate transaction costs, improve product coordination and bargaining power balance between the contracting parts, it would be expected that farmers would look for the implementation of such institutions all the time. However, certain changes in market conditions may stimulate to breach the contract and/or holding up the collective action by one or both actors (Gow *et al.* 2000). In run (B) the model forecasts a breach of the group contract under low supply of fresh pepper just because it becomes too expensive or unattractive. However, if the production might be stable through the year, with a weekly supply and no season differentiation, group contracts would be chosen all the time. Notwithstanding, pepper production in Costa Rica is done by producers with a low technology and input package, and by using a strong but low-productive plant variety (*Balankota*). Therefore we have two production seasons, with unbalanced amounts of fresh pepper and irregular supply, from producers with different decisions on their production systems (Ruben and Sáenz, *forthcoming*).

For future development of pepper production, there is a need for an increase in productivity and stabilization of production throughout the year, with the aim of increasing (and stabilizing) the frequency of transactions, to improve trust between actors, encourage low opportunistic behaviour, and, thereby, strengthen vertical integration between both parties. This goal would require re-converting the whole current production system, by progressively substituting the current pepper plants with high-productive varieties and increasing input use. Yet, this re-conversion may be too risky and expensive for low-income producers. Therefore, the firm might start by helping farmers to increase productivity with the current variety. This can be done by changing the present market specification contract for a production management contract; otherwise, seasonal contracts under irregular supply through the year would be still the best scenario.

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Table 1. Price and governance structure in three runs

Run	Market form	Market power[1]	Contract Structure[2]	Behaviour[3]	Price of fresh pepper ($/kg)	
#		w			Low season	High season
	In case of individual contracts between one buyer and several sellers					
A	Monopsony	1	IC	Low-opp		
A	Monopsony	1	IC	High-opp		
B	Monopsony	1	IC	Low-opp		
B	Monopsony	1	IC	High-opp	0.681	
C	Monopsony	1	IC	Low-opp		
C	Monopsony	1	IC	High-opp		
	In case of a group contract between one buyer and one group of sellers					
A	Monopsony	1	GC	Low-opp	0.729	0.632
A	Monopsony	1	GC	High-opp		
B	Joint profit maximization	0.5	GC	Low-opp		1.062
B	Joint profit maximization	0.5	GC	High-opp		
C	Monopoly	0	GC	Low-opp	0.967	1.062
C	Monopoly	0	GC	High-opp		

1 w=1: In case of IC, monopsony; in case of GC, monopsony as a limiting case; w=0: GC only, monopoly as a limiting case; w=0.5 GC only, joint profit maximization as a possible outcome of negotiation process

2 IC: Individual contract, GC: Group contract

3 Behaviour: Low-opp: low opportunistic behaviour of either the seller and/or the buyer
High-opp: high opportunistic behaviour of either the seller and/or the buyer

Table 2. Income levels of processor and farmers in three runs

Run	Market form	Market power[1]	Contract Structure[2]	Behaviour[3]	Realised income ($/year)		
#		w			Firm	Farmers' total	Average per farmer
	In case of individual contracts between one buyer and several sellers						
A	Monopsony	1	IC	Low-opp			
A	Monopsony	1	IC	High-opp			
B	Monopsony	1	IC	Low-opp			
B	Monopsony	1	IC	High-opp	40,618	23,502	1,237
C	Monopsony	1	IC	Low-opp			
C	Monopsony	1	IC	High-opp			
	In case of a group contract between one buyer and one group of sellers						
A	Monopsony	1	GC	Low-opp	107,140	46,490	2,447
A	Monopsony	1	GC	High-opp			
B	Joint profit maximization	0.5	GC	Low-opp	31,012	48,560	2,451
B	Joint profit maximization	0.5	GC	High-opp			
C	Monopoly	0	GC	Low-opp	67,425	86,205	4,537
C	Monopoly	0	GC	High-opp			
	Total incomes under each run						
A					107,140	46,490	2,447
B					72,630	70,062	3,687
C					67,425	86,205	4,537

1, 2 and 3: see Table 1