Contracting, negotiation, and the policy change: The conflict between Korean farmers and their agricultural cooperatives

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Abstract: Farmers- owned agricultural cooperatives should have the same interests with their farmer owners. However, the operating team of the cooperatives may have different interests. Under this situation, the terms of contract between farmers and cooperatives are important to both sides. Farmers' share of the cooperatives' profits specified in the contracts is an important issue in the long- term sustainability of rice processing and marketing in Korea. This paper discusses the behavior of farmers and their cooperatives in determining the optimal share of profits in their contracts. It also illustrates the impacts of the policy changes due to the Korea's accession to the WTO on the relative negotiation power between farmers and cooperatives. The results show that the Korean rice cooperatives have more negotiation power than farmers. They set the profit share to farmers based on their own profit maximization criteria, while taking farmers supply decision into consideration. Farmers only choose how much to supply. This relationship was seen changing after 2005, when the Korean government reduced and removed the price subsidy it provided to rice cooperatives before. As the cooperatives' margin goes down without the subsidy, farmers are pushed to bargain hard for their share of the margin to maintain their revenue.

Key words: contracts, principal-agent, cooperatives, market risk

Agricultural spot markets are being replaced by the contract-farming and the systems of vertical coordination (Hendrikse and Bijman 2002) worldwide, and there is a large number of publications focusing on contract farming (Allen and Leuck 1995; Bolwig et al. 2009; Hellin et al. 2009). Farmers sell their commodities to a firm under contract, which then processes and markets them. Often the contract, including the commodity price, is designed by the firm (Wu 2006). A cooperative is a very important form of business organization in the agricultural supply chain, which is a user-owned and user-controlled business that distributes profits on the basis of use (USDA 1978; Cobia 1989). This user-benefit principle is often stated as business at cost; that is, cooperatives return the benefits over cost to their member-farmers through the patronage refunds, dividends, unallocated reserves, and other forms (Knoeber and Baumer 1983; Staatz 1987b).

A cooperative is assumed to act as an agent that pursues better prices for the products of their members in the market, and it tries to maximize the member welfare given the incentive and information constraints (Sexton et al. 1989; Vercammen et al. 1996). In this case, there should be, theoretically, a minimal conflict with respect to the contract price between the cooperative management teams and their member-farmers, because if a lower price is offered, the loss of the farmers will be compensated by the gain for the cooperatives and an offsetting dividend distribution or increased equity; and if a higher price is offered, the loss of the cooperatives would be absorbed by the farmer members in reduced benefits.

However, member-farmers often worry that cooperatives will not return their profits due to the management failure, equity reserves, the managers' personal benefit maximization, etc. (Yim 2004). These problems are serious in many cooperatives in which the ownership and management are divided, that is, a team of professional managers is hired for the cooperative, who have a little connection with the farmers. Therefore, when cooperatives contract the price of the agricultural commodity with members, the members want the highest price they can receive. In particular, farmers have a tendency to stick to their prices based on the past experience and contract negotiations are influenced by the results of previous negotiations (Babb et al. 1969). On the other hand, farmers may not care about the loss of the cooperative because the cooperative has accumulated equity in previous years and it can likely absorb losses without making their member farmers pay. This phenomenon

is counter to the traditional cooperative principles, and makes it difficult to determine the optimal contract price between farmers and cooperatives.

There are many studies about agricultural cooperatives and vertical integration or coordination. Some have focused on the reason why farmers organize their cooperative (Ladd 1974; Staatz 1987a; Rehber 1998; Fulton 1999) which is to gain the bargaining power against processors or wholesalers. Others have focused on the principal-agent problem in the context of risk sharing (Williamson 1979; Grossman and Hart 1983; Hennessy and Lawrence 1999; Preckel et al. 2004; Wang et al. 2011). Bogetoft and Olesen (2002) studied important rules for the vertical integration contracts to resolve conflicts between farmers and their cooperatives over the price and the quality of a commodity.

Rice is the most important commodity in Korean agriculture. In 2006, 73% of farmers cultivated rice, which accounted for 50% of the total agricultural income. The Korean government purchased rice from farmers at an above market price until 2005 to support farm income. However, since Korea signed agricultural trade agreements in the World Trade Organization (WTO) Uruguay Rounds in 1994, the government has gradually reduced and eventually eliminated the purchases in 2005. This also stimulated the modernization of the rice industry, in which the government provided subsidies to grower cooperatives and private companies to establish a new processing system called the Rice Processing Complex (RPC). Furthermore, the policy change forced rice production and marketing to adapt to the international environment through vertical integration with a low price, high quality, and branding.

There are about 200 cooperatives serving about 180 thousand rice farmers. Cooperatives are not of the same size, ranging from contracting with two hundred farmers to two thousand ones with the average of 900 farmers. In the past, agricultural cooperatives received commissions from the government through storing the rice it bought and making the delivery according to the government's guidelines. However, the cooperatives' role started to change in 1994 according to the RPC. Contracts were gradually adopted by the cooperatives to secure rice from the growers. Conflicts between the cooperatives and their member-farmers emerged. The cooperatives wanted the price at the market level, while farmers demanded a higher level similar to the previous government price. The cooperatives had a tendency to accommodate the farmers' demand because the cooperatives are owned by the growers and their executive officers are elected by and from the farmers. So, until 2004, it was common for the cooperatives to buy rice at the high government price. The loss realized by the cooperatives due to the higher purchasing price was compensated by the profits made from other activities of the cooperatives such as financial services to farmers. Even though, the rice price still had more uncertainty than the former government prices.

The previous studies have not analyzed the conflicts between the principal and the agent. Other studies have not investigated the price negotiation between the member-farmers (principal) and their cooperative (the agent) because this is not an issue in the cooperatives in most other countries except Korea.

This research will explore the negotiation between the Korean rice farmers and their cooperatives to distribute the profit from rice production, processing, and marketing under the market price risk. Specific objectives of the paper include (1) to develop a theoretical model of price determination between farmers and cooperatives, (2) to build an empirical model to test the hypothesis of the alternative negotiation power, and (3) to examine the impact of the Korean rice price subsidy policy change on the negotiation behaviors of the farmers and the cooperatives.

THEORETICAL MODELS

We first consider a situation when there is one agricultural cooperative and many of its farmer-members. This situation is common because the agricultural cooperative law in Korea forces farmers to be a member of a cooperative in the region where they live and cultivate crops.

The primary risk is the price that the agricultural cooperative receives when selling rice to wholesalers and retailers. A farmer is assumed to receive a share of the net margin from the cooperative, which equals the market price received by the cooperative less its processing cost, plus a dividend. That is, the contract price is set as a proportion of the market price less the unit processing cost. The farmer's problem is to maximize the expected utility of his/her income from producing and marketing rice through the cooperative, and it can be stated as follows:

$$\max_{q\geq 0} \; E[u_i([\alpha(p-c_c)-c_f+\phi]q_i)] \qquad (1)$$

where u_i denotes the utility function of i^{th} farmer, α denotes the fraction of net margin of the cooperative paid to the farmer, c_c denotes the unit processing cost of the cooperative, c_f denotes the unit production cost which is uniform across all farmers, ϕ denotes the dividend paid by the cooperative to the farmer per one unit of the commodity, q_i denotes his/her production quantity, and $E[\ ]$ is the mathematical expectations operator. p is the random price variable with mean,

μ, and variance, σ^2. The agricultural cooperative will accept all the farmers' supply to fully occupy its processing capacity. The farmer decides the amount to produce.

Net profit is a linear transformation of the only random variable, p, in the problem, so that the probability distributions of net profit differ only by the location and scale.[1] Under these circumstances, the choices are consistent with a mean variance model (Meyer 1987). Hence, the above problem is represented by:

$$\max_{q\geq 0} E\{[\alpha(p-c_c)-c_f+\phi]q_i\}-\frac{\rho_i}{2}Var\{[\alpha(p-c_c)- -c_f+\phi]q_i\} = \max_{q\geq 0}[\alpha(\mu-c_c)-c_f+E\phi]q_i - -\frac{\rho_i}{2}[\alpha^2\sigma^2+Var(\phi)+2\alpha\,\mathrm{cov}(\phi,p)]q_i^2 \quad (2)$$

where ρ_i is the farmer's risk aversion coefficient at the expected price, and σ^2 is the variance of the price. Assuming the farmer is risk averse, $\rho_i > 0$, , and the expected profit is at least nonnegative to avoid a corner solution of the model, $\alpha(\mu - c_c) - c_f + E\phi > 0$, the optimal solution for (2) is:

$$q_i^* = \frac{\alpha(\mu-c_c)-c_f+E\phi}{\rho_i[\alpha^2\sigma^2+Var(\phi)+2\,\mathrm{cov}(\phi,\alpha p)]} > 0 \quad (3)$$

Four scenarios are examined in this analysis, each representing an alternative way of determining the profit share between the farmers and the cooperative. In all scenarios, the farmers are assumed to be risk averse, while the agricultural cooperative is assumed to be risk neutral. Both rice production and processing are assumed to have constant returns to scale.

In the first scenario, all the profits of the cooperative are distributed to farmers through their patronage, although a portion of the profit may be distributed as shares instead of cash. This is a common situation for cooperatives in countries like the U.S. The nature of the contractual arrangement is that the cooperative pays farmers a predetermined fraction (α) of its net margin and a residual dividend (ϕ) of its net margin. In the second scenario, the cooperative pays the farmers a fraction (α) of its net margin only and decides the size of the fraction to maximize its own profits subject to the constraint that farmers are at least break-even. This scenario assumes that the cooperative has more bargaining power on the contract than the farmers: the principal of the cooperative (the farmers) makes a commitment to share the profits with their agent (the cooperative). In the third scenario, the cooperative pays the farmers a fraction (α) by negotiating the size of the share with the farmers. This scenario assumes that the cooperative and the farmers have an equal bargaining power to decide the optimal share of the profits, and the cooperative acts as a private processor. In the fourth scenario, the cooperative pays a fraction (α) determined by the farmers to maximize their profits under the constraint that the cooperative's expected profit is at least at a certain target profit level. This scenario indicates that the farmers have more bargaining power.

Each of the scenarios is discussed in the following. We assume that the farmers are homogeneous, so $\rho_i = \rho$, and $q_i = q$ for all i.

Scenario 1: A general contract case of a cooperative with dividends

In this scenario, the cooperative's problem is to maximize its expected profit, π, as in (4). The two constraints include one for **the farmers' optimal production** behavior and all profits are distributed to farmers.

$$\max_{\alpha\geq 0,\phi\geq 0,n\geq 0} E[[(1-\alpha)(p-c_c)-\phi]Q] = \max_{\alpha\geq 0,\phi\geq 0,n\geq 0}[(1-\alpha)(\mu-c_c)-\phi]Q \quad (4)$$

The total number of farmers, n, is constant, reflecting that the cooperative accepts all farmers in the area. So, the total production, Q, is determined as $q \times n$. The optimal solution for the fraction (α) in this problem is not unique. At least one solution can be that the fraction is set at zero, $\alpha = 0$, and all the posterior profit is returned in the form of the dividends, and the expected dividend a priori is $E(\phi)=\mu - c_c$, and $Q = n(\mu - c_c - c_f)/\rho\sigma^2$. Another solution is $\alpha = 1$, and $\Phi = 0$, Q remains the same.

The results show that under this scenario, there is no need to use the principal agent model to determine the optimal share of the profits of the cooperative between the farmers and their cooperative due to the dividends. There is no conflict of interests between the farmers and the cooperative. The size of the profit share is not important, as long as all profits are returned to the farmers. This scenario is consistent with the results of the existing literature.

However, if the cooperative behaves as a private entity with different interests than those of the farmers, the principal agent model will be appropriate. Or, when the cooperative is large and the farmers feel they have no control and cannot liquidate their shares, and they only value the cash distribution, such as the conditions which exist in the Korean rice

[1]Although the residual dividend appears to be another random variable potentially, we will see it is either zero or a liner function of p. Therefore, the farmer's net income still satisfies the location and scale condition.

sector, then the principal agent model characterizes the situation better. The following three scenarios are all in this category.

Scenario 2: The cooperative chooses the optimal share of profits

Now consider the case where farmers choose the supply, and the cooperative chooses the optimal share of profits without any dividend, $\phi=0$. In this case, the behavior of the farmers is unchanged as in equation (1) through (3). The cooperative's problem changes to:

$$\max_{\alpha\geq 0} E[(1-\alpha)(p-c_c)nq^*] = \max_{0\leq\alpha\leq 1} (1-\alpha)(\mu-c_c)nq^* \quad (5)$$

The solution to this problem is:

$$\alpha^* = \frac{2c_f}{\mu - c_c + c_f} \quad (6)$$

The fraction of profits the farmers receive is increasing with their own marginal cost, c_f, and decreasing with the net margin of the cooperative, $\mu - c_c$.

Scenario 3: Farmers and the cooperative negotiate the optimal share of profits

Now consider the case where farmers choose the supply, do not receive a dividend ($\phi = 0$), and negotiate the share of profits, α, with their cooperative at a level at which the expected utility-cost ratio of the farmers is equal to the expected return-cost ratio of the cooperative ($Eu/qc_f = E\pi/nqc_c$). Under the mean-variance model, the expected utility is actually the certainty equivalent of profit. This ratio equality means both parties will have the same certainty equivalent rate of return to operating investment. The fraction of profits that the farmers receive is determined by the following equation.

$$\frac{Eu}{qc_f} = \frac{E\pi}{nqc_c}$$

$$\frac{Eu}{qc_f} = \frac{[\alpha(\mu-c_c)-c_f]q - \frac{\rho}{2}\alpha^2\sigma^2q^2}{qc_f} = \frac{\alpha(\mu-c_c)-c_f-\frac{\rho}{2}\alpha^2\sigma^2q}{c_f}$$

$$\frac{E\pi}{nqc_c} = \frac{(1-\alpha)(\mu-c_c)}{c_c} \quad (7)$$

The solution to this problem is:

$$\alpha^{**} = \frac{2c_f(\mu-c_c)+c_cc_f}{(\mu-c_c)(2c_f+c_c)} = \frac{c_f(2\mu-c_c)}{(2c_f+c_c)(\mu-c_c)} \quad (8)$$

As long as the expected price can cover the costs of both the farmers and the cooperative, $\mu - c_c - c_f \geq 0$, the fraction (α^{**}) is in the range of zero and one, and the negotiation power between the farmers and the cooperative can be said to be in balance.

Scenario 4: Farmers choose the optimal share of profits

Now consider the case where the farmers choose the supply and the fraction of the cooperative's net margin and keep the cooperative's profits at the level of $E\pi \geq \pi_0$. π_0 is the target profits that the cooperative sets. In this case, the farmer's problem is rewritten as:

$$\max_{q\geq 0} E[u_i([\alpha(p-c_c)-c_f]q_i)]$$

$$\text{subject to} \quad E\pi = \pi_0 \quad (9)$$

where u_i is the farmer's utility function. Again, using the mean-variance model we have:

$$\max_{\alpha\geq 0,\, q\geq 0} E[\alpha(p-c_c)-c_f]q_i - \frac{\rho_i}{2}V[\alpha(p-c_c)-c_f]q_i^2 = \max_{\alpha\geq 0,\, q\geq 0} [\alpha(\mu-c_c)-c_f]q_i - \frac{\rho_i}{2}\alpha^2\sigma^2q_i^2$$

$$\text{subject to} \quad E\pi = \pi_0 \quad (10)$$

The constraint of this problem requires:

$$\alpha^{***} = 1 - \frac{\pi_0}{(\mu-c_c)nq^{***}}, \quad q^{***} = \frac{\mu-c_c-c_f}{\rho(\alpha\sigma)^2} + \frac{\pi_0}{n(\mu-c_c)} \quad (11)$$

In this scenario, if π_0 is zero, α^{***} is one: this means that the farmers get all profits of the cooperative and this is the same as in the scenario 1; and if π_0 is actually less than zero, α^{***} is more than one, which means that the farmers force the cooperative to run at a loss by offering a higher than its break even price. This is quite reasonable in the Korean case because the cooperatives received the government subsidies prior to 2005, and the cooperatives compensated themselves by the profits from their other financial service activities even after the subsidy was terminated.

We summarize the relationships between the farmers' share of the cooperative's net margin and each of the three variables: market price, production cost of farmers, processing cost of cooperatives under each scenario in Table 1.

EMPIRICAL MODEL AND DATA

Based on the equations (6), (8), and (11), we can establish an econometric model (12) using the data

Table 1. The relationship between the profit share and price and costs

Profit share	Market price (μ)	Marginal cost of the	
		cooperative (c_c)	farmer (c_f)
Scenario 1 (α)	0	0	0
Scenario 2 (α^*)	–	+	+
Scenario 3 (α^{**})	+	+/–	+
Scenario 4 (α^{***})	+	–	0

Note: zeros, –, + and +/– means the profit share does not change, decreases, increases and changes either way with the corresponding variables, respectively

from the Korean rice industry to test which of the scenarios is currently dominating. In addition to the price and cost variables, p, c_c and c_f, a policy change dummy variable is included in the econometric model for us to find out the impact of the policy change in 2005 on the contracting behavior.

$$\alpha = \beta_0 + \beta_1 p + \beta_2 c_c + \beta_3 c_f + \beta_4 Dum + \beta_5 pDum + \\ + \beta_6 c_c Dum + \beta_7 c_f Dum + \varepsilon \quad (12)$$

Dum is the dummy variable representing the policy change, *pDum* is the product of price and the dummy variable to reflect the interactive effect of market price and policy change. Similarly, $c_c Dum$ and $c_f Dum$ are the interactive terms for the effects of the policy change with the cooperatives' marginal cost and with the farmers' marginal cost. ε is an error term.

We consider a panel data model with fixed and random effects depending on the Hausman test. If an unobserved fixed effect is correlated with each explanatory variable in all time periods, we will use the fixed effects model (Wooldridge 2005).

The data used in this analysis include five years of financial data (income statement) from 109 agricultural cooperatives and the published marginal production costs in Korea, from 2002 to 2006, obtained from the National Agricultural Cooperative Federation in Korea.

Table 2. Descriptive statistics of the data

Variable	Mean	Std	Minimum	Maximum
α (ratio)	1.03	0.06	0.89	1.52
p (won/kg)	2 031.99	207.70	1 368.60	2 785.07
c_c (won/kg)	283.38	151.88	18.79	912.38
c_f (won/kg)	1 706.29	160.58	1 359.88	2 190.46
Dum (policy)	0.40	0.49	0.00	1.00

The share of cooperatives' profit received by farmers (α) is calculated by dividing the price that a farmer receives from a cooperative by the unit profit of the cooperative from selling rice, per kilogram. The price (p) is the marginal revenue that a cooperative receives from the rice market, which is different in each cooperative because the price depends on the marketing ability of the cooperative, the quality of the rice, the traditional regional brand, and other consumers' preferences. The marginal cost of a cooperative (c_c) is the processing cost per kilogram of rice. The farmer's marginal cost (c_f) is at the regional average level because the individual farmer's production cost is not available. The Korean government surveys the production cost of rice from farmers every year and publishes the average cost for each of the eight regions in Korea. The dummy variable for policy change (*Dum*) is 0 from the years 2002 to 2004 and 1 for 2005 and 2006. The descriptive statistics of the data are reported in Table 2.

RESULTS

Table 3 reports the results of the fixed effects model. We considered three alternative ways to model the policy

Table 3. Determinants of the farmers' optimal profits share using the fixed effects model

	Model 1	Model 2	Model 3
p	–0.0142*** (–9.04)	–0.0443*** (–22.32)	–0.0503*** (–25.90)
c_c	0.0142*** (9.90)	0.0355*** (22.78)	0.0414*** (20.80)
c_f	0.0021 (1.52)	0.0039*** (3.72)	0.0033*** (3.45)
Dum		–9.5443*** (–18.75)	–52.9313*** (–10.37)
pDum			0.0136*** (9.15)
$c_c Dum$			–0.0103*** (–4.65)
$c_f Dum$			0.0113*** (4.40)
R square	0.61	0.79	0.83
F-value	6.12	14.12	17.80
Obs	545	545	545

Note: The number in a parenthesis is t-value, *** indicates the significant level at 99%

change in the econometric model. Model 1 does not include any policy variables explicitly, model 2 includes a dummy variable for the policy change, and model 3 includes the dummy variable and its interaction with each of the other explanatory variables.

The results show that the price (p) negatively affects the optimal share of profits, indicating the fraction of profits that the farmers receive decreases as the price that the cooperative receives from the market increases. The farmer's share of the cooperative's margin increases as the marginal cost for the farmer (c_f) increases. The fact that the farmer's share also increases as the marginal cost of the cooperative (c_c) increases may be caused by shrinking of the net margin size, just like the reduced market price. These effects indicate that the cooperatives have a bigger influence on the share (α), and they allocate less to the farmers and more to themselves when a higher price is received. They take the farmers supply response into consideration because the farmers would supply less if the price offered to them is low relative to their production cost. The farmers request a higher share when the market price received by the cooperative decreases or when its processing cost increases so that their farm level price is not reduced much. When their own production cost increases, they also need to be paid more.

Applying these results to the scenarios 1, 2, 3, and 4, the sign of the coefficient of the price (β_1) is negative, the sign of the coefficient of the marginal cost of the cooperative (β_2) is positive, and the sign of the coefficient of the marginal cost of the farmers (β_3) is also positive. Those signs match exactly the second scenario before the policy change, implying that the cooperative have more decision power before the policy changes.

The signs of the policy dummy variable in both models 2 and 3 are negative, indicating the policy change makes the optimal share of margin decrease. Remember the share we used in the analysis is the share of the cooperatives' overall net margin including the government subsidy prior to 2005, and the cooperatives' net margin became lower after 2005 without the subsidy, the cooperatives then tried to lower the share provided to the farmers.

The magnitudes of the coefficients of the interactive dummy variables are either small or have the same sign as the original slope coefficients. Consequently, the signs of the slope coefficients after the policy change remain the same as the signs before the policy change. This indicates the policy did not change the nature of the relative power between the cooperatives and the farmers. Although these signs are the same, the magnitude of the coefficients shifts the relative power toward scenario 3. Specifically, β_1 gets less negative, and β_2 gets less positive. This means that the policy change pushes the cooperative and the farmers to negotiate jointly for the optimal share of margin. As the market price increases, the cooperatives no longer can reduce the farmers' share by a large amount as they did before. The farmers still respond to the optimal share of margin according to their marginal cost, but they now have a tendency to get a higher fraction of the cooperative's profits. These behaviors go toward the third scenario which explains the negotiations between the farmers and the cooperative. In other words, the policy change pushes the farmers to exercise their negotiation power on the optimal share of margin more aggressively.

CONCLUSION

Globalization, the policy change, and the increased competition in the domestic rice market are all putting pressure on Korean agricultural cooperatives to make an efficient contract for vertical coordination with their member-farmers. The optimal share of the cooperative's profits is a crucial issue in the long-term sustainability of rice processing and marketing. This paper explains the negotiation behaviors of the farmers and their cooperative for determining the optimal share of margin in their contracts, and it also explains the effect of the policy change that has impacted the behaviors of determining the optimal sharing of margin.

Before 2005, the price that the cooperative received in the market was inversely related to the optimal share of margin paid to farmers, and the marginal cost of the cooperative and the marginal cost of the farmers increased the optimal share of margin. This result came from the fact that the cooperatives are the contract setters based on their own profit maximization, and the farmers can only choose the quantity supplied. This phenomenon was common in Korean agricultural cooperatives.

However, these behaviors started to change after the policy change. The price is still inversely related to the optimal share of margin, but the impact of the price is smaller. Also, the marginal cost of the cooperative affects positively the share, but the impact of the cost tended to be negative. This result shows the tendency that the negotiation power of the cooperative gets weaker, and the power of the farmers gets stronger. This is because the policy change reduces the government subsidies to rice cooperatives, so that rice farmers have to fight harder to obtain more favorable farm level prices.

This case provides an interesting empirical evidence that the agricultural cooperatives' interest and its owner – farmers' interests are not consistent. They behave like a principal and an agent in the market integration relationship.

REFERENCE

Allen D.W., Lueck D. (1995): Risk preferences and the economics of contracts. American Economic Review, *85*: 447–451.

Babb E.M., Belden S.A., Saathoff C.R. (1969): An analysis of cooperative bargaining in the processing tomato industry. American Journal of Agricultural Economics, *51*: 13–25.

Bogetoft P., Olesen H.B. (2002): Ten rules of thumb in contract design: Lessons from Danish agriculture. European Review of Agricultural Economics, *29*: 185–204.

Bolwig S., Gibbon P., Jones S. (2009): The economics of smallholder organic contract farming in tropical Africa. World Development, *37*: 1094–1104.

Cobia D.W. (1989): Cooperatives in Agriculture. Prentice Hall, London.

Fulton M. (1999): Cooperative and Member Commitment. Finnish Journal of Business Economics, *4*: 418–437.

Hellin J., Lundy M., Meijer M. (2009): Farmer organization, collective action and market access in Meso-America. Food Policy, *34*: 16–22.

Grossman S.J., Hart O.D. (1983): An analysis of the principal-agent problem. Econometrica, *51*: 7–45.

Hendrikse G., Bijman J. (2002): Ownership structure in agrifood chains: the marketing cooperative. American Journal of Agricultural Economics, *84*: 104–119.

Hennessy D.A., Lawrence J.D. (1999): Contractual relations, control, and quality in the hog sector. Review of Agricultural Economics, *21*: 52–67

Knoeber C.R., Baumer D.L. (1983): Understanding retained patronage refunds in agricultural cooperatives. American Journal of Agricultural Economics, *65*: 30–37.

Ladd G.W. (1974): A model of a bargaining cooperative. American Journal of Agricultural Economics, *56*: 509–519.

Meyer J. (1987): Two moment decision models and expected utility maximization. American Economic Review, *77*: 421–430.

Preckel P.V., Gray A., Boehlje M., Kim S. (2004): Risk and value chain: Participant sharing of risk and rewards. Chain and Network Science, *4*: 25–32.

Rehber E. (1998): Vertical Integration in Agriculture and Contract Farming. Food Marketing Policy Center, Working Paper 46, University of Connecticut.

Staatz J.M. (1987a): Farmers' Incentives to Take Collective Action via Cooperatives: A transaction Cost Approach. In: Royer J.S. (ed.): Cooperative Theory: New Approaches. ACS Service Report Number 18, USDA, Washington, D.C., pp. 87–107.

Staatz J.M. (1987b): The Structural Characteristics of Farmer Cooperatives and Their Behavioral Consequences. In: Royer J.S. (ed.): Cooperative Theory: New Approaches. ACS Service Report Number 18, USDA, Washington, D.C., pp. 33–60.

Sexton R.J., Wilson B.M., Wann J.J. (1989): Some tests of the economic theory of cooperatives: methodology and application to cotton ginning. Western Journal of Agricultural Economics, *14*: 55–66.

USDA (1978): Cooperatives in Agribusiness. Cooperative Information Report 5.

Vercammen J., Fulton M. Hyde C. (1996): Nonlinear pricing schemes for agricultural cooperatives. American Journal of Agricultural Economics, *78*: 572–584.

Wang H.H., Yanping Z., Laping Wu (2011): Is contract farming a risk management instrument for Chinese farmers? Evidence from a survey of vegetable farmers in Shandong. China Agricultural Economic Review, *3* (3), in print.

Williamson O.E. (1979): Transaction-cost economics: The governance of contractual relations. Journal of Law and Economics, *22*: 233–261.

Wooldridge J.M. (2005): Introductory Economics: A Modern Approach. South-Western College Publishing, Cincinnati.

Wu S.Y. (2006): Contract theory and agricultural policy analysis: A discussion and survey of recent development. Australian Journal of Agricultural and Resource Economics, *50*: 490–509.

Yim Y.S. (2004): New Capital Raising Methods for Cooperatives in the World. Research Institute for Cooperatives, National Agricultural Cooperative Federation, Korea.

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