

Local Development through the Interaction in International Business Contract Mechanism: The Case of Bolivian Quinoa Producers

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Abstract:

In the Andean region, many small rural farmers continue to depend on semi-subsistence farming systems, resulting among others in low levels of productivity. In order to cope with these problems, some empirical studies show that consolidation of horizontal and vertical relations between different stakeholders is useful to facilitate farmers' knowledge and to improve their competitiveness. We study the contractual relation between private firms linked to international markets and rural farmers in the quinoa cluster in Bolivia as a mechanism to achieve network embeddedness, capture of international market knowledge and upgrading. Results of this analysis show that through the "contract mechanism" the direct interaction of farmers with private companies linked to international business not only brought income benefits for the companies, but also "quinoa farmers" improved their income level with the overall development of the industry, which resulted in a positive impact in local development.

1. Introduction

In many parts of the world many small rural farmers continue to depend on semi-subsistence farming systems characterized by insufficient access to equipment, finance, and advanced knowledge, resulting among others in low levels of productivity. Bolivia's Altiplano quinoa farmers are no exception. It is very difficult to identify how to link this small local farmers with international market benefits, and their situation does not seem to improve despite of the continuous efforts of extension and development programs. Recently, some empirical studies show that the consolidation of horizontal and vertical relations between different stakeholders of the chain in a cluster is especially useful in order to facilitate farmers' knowledge development and consequently enhance their competitiveness. In this paper, our aim is to analyze the mechanism through which the business relationship between private firms and small producers in the quinoa cluster in Bolivia achieved network embeddedness and linked rural farmers with international market benefits.

World market integration process resulted in an increasing challenge for resource-poor farmers. New and demanding quality standards arise as a consequence of food safety

concerns and also due to growing civic and corporate social and environmental responsibility (Schröder, 2003). Thus, differences between the different stakeholders of value-chains in a cluster are created, and access to information and resources undermine the ability of the weaker in the chain to meet those requirements. Furthermore, it is very difficult to know who needs what type of information in order to make well-reasoned decisions, to learn and innovate, and finally to upgrade their production in order to meet shifting international market requirements (Vermeulen and Ras, 2006). Under this situation where markets do not seem to work for efficient resource allocation, an institutional support framework like the community mechanism of contract enforcement based on trust and a long relationship plays an important role, supporting and reducing transaction costs in rural communities in developing countries (Hayami and Kawagoe, 1993, Sonobe and Otsuka, 2006).

We focus on this “mechanism” and how a group of firms (merchants) through their links to international markets capture knowledge, and promote international market oriented upgrading in their supplying farmers. Furthermore the study seeks to identify and determine empirically if the contractual relation between those private firms and rural farmers have a positive impact in local development, evaluating mainly the impact in consumption level, family income and capitalization for quinoa farmers. In the next section, background of the quinoa clusters in Bolivia and the commercial interaction implemented are reviewed. Following, the data set is presented, and then the empirical results are reported. The final section concludes the discussion.

2. Background

The High Plateau of the Peruvian-Bolivian Andes, known as the Altiplano, where quinoa is also produced, is one of the poorest areas in the world. More than 4 million people of Quechua and Aymara origin inhabit this area, and over 75% of the population, whose livelihoods depend on agriculture, live in poverty. Traditionally farmers raised potato, quinoa, barley, grasses, and herds of llamas and alpacas. Through centuries farmers have practiced complex and successful farming systems that have relied upon management of water, soil, and biodiversity to produce crops and livestock. However, the market economy, climate change and rise of population have established a new framework, where traditional strategies are no longer sustainable. Nowadays, low productivity and environmental degradation are the main characteristics in this area where migration and social tensions also prevail (Li Pun, Mares, Quiroz, León, Valdivia, Reinoso, 2006).

Quinoa grain was originated in the Andean region of South America, and it has been an important crop for around 5,000 years. Its name is the Spanish spelling “quinua” of the Quechua name. Quinoa means “mother of all grains” in the Inca language. This crop was a staple food of the Inca people and remains an important food crop for their descendants, the Quechua and the Aymara. It has a great importance for its nutritional value, as its protein content is very high (12-18%), making it a healthful choice for vegetarians and vegans. Unlike wheat or rice, quinoa contains a balanced set of essential amino acids for humans, making it an unusually complete protein source according to FAO standards. Quinoa is gluten-free and considered easy to digest. Because of all these characteristics, quinoa is being considered a possible crop in NASA's Controlled

Ecological Life Support System for long-duration manned spaceflights (Schlick and Bubenheim, 1993).

Quinoa is divided mainly in two types Royal and Sweet. The first one only grows in the southern Altiplano of Bolivia, and is adapted to an extreme cold and dry weather (200 to 400 mm of annual rain), salty soils, and high altitudes (3700 to 4200 m. above sea level). These extreme conditions produce a bigger grain with increased nutritional values. Royal Quinoa is bigger in size (above 1.7mm) when it is compared with the other varieties in Bolivia, Peru, Ecuador and other countries. It has a shiny white color, and the principal characteristic is that quinoa has a better nutritional content due to its better amino acid balance (JETRO 2005).

2.1 Description of quinoa's market value

The grain is mainly produced in South America, in 2007 Bolivia and Peru represented 45% and 54% of total world production. According to FAO (FAOSTAT) in that year world production reached 59,115.0 TM. In its majority quinoa is produced by small farmers in the Altiplano, where agronomic and land conditions for effective crop production are severely constrained by persistent harsh meteorological events, such as hail, locally torrential rains, flooding, drought, and especially frost (Kolata, 1996). In Bolivia's Altiplano, north, south and central, almost 70 thousand small farmers are involved in the activity, the largest landowners possess 51 to 60 ha. (Figure 1) and more than 50% of them hold between 0.1 and 20.0 ha. (Collao, 2004).



ha.	Land Tenure - Family %		
	Altiplano North	Altiplano Central	Altiplano South
01-10	40.0	22.2	39.5
11-20	31.4	47.2	46.5
21-30	11.4	19.5	11.5
31-40	8.6	5.6	2.5
41-50	5.8	2.7	
51-60	2.8	2.8	

Source: Altiplano Agricultural Technological Development Foundation (FDTA)

Figure 1. Region of production of quinoa and land tenure in Bolivia's Altiplano

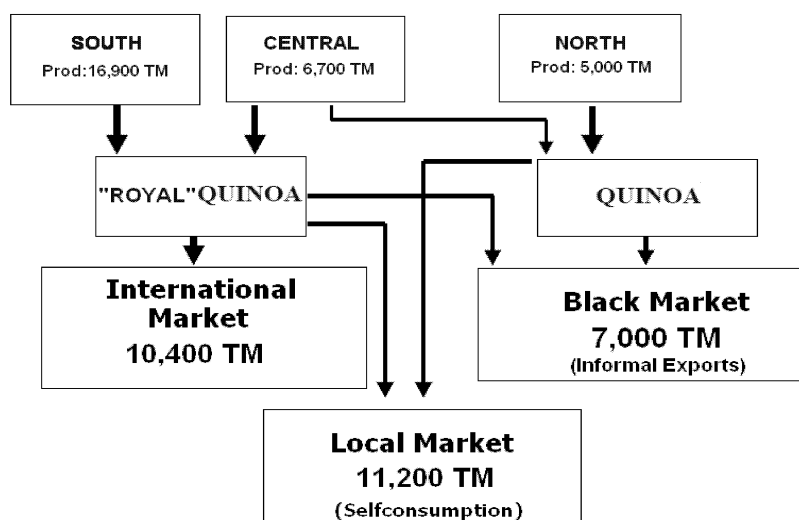
Under this framework, productivity levels in Bolivia reached between 460 and 638kg/ha in the last 7 harvest periods (table 1). In the period 2001-2007 there was an expansion of the area and the production, however there were no major changes in productivity levels.

Table 1. Area, production and productivity of quinoa in Bolivia

	2001/02	2002/03	2003/04	2004/05 (p)	2005/06 (e)	2006/07 (e)	2007/08
Area (Ha)	33,865	45,680	43,782	44,877	49,357	50,375	50,356
Production (MT)	21,623	26,539	24,757	25,648	25,907	23,190	28,809
Productivity (Kg/Ha)	638	581	565	572	525	460	572

Source: Ministry of Agriculture of Bolivia (MDRYT)

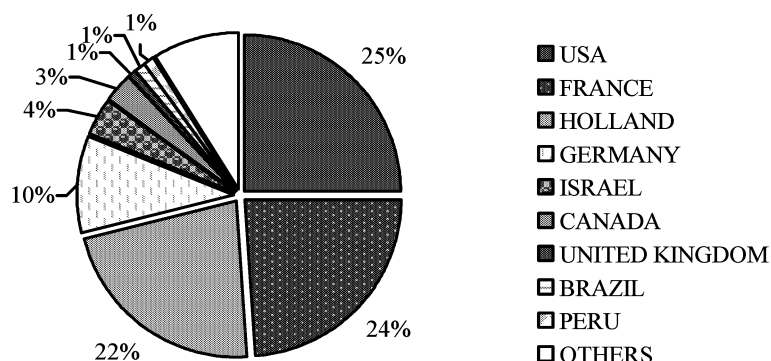
Bolivia's Altiplano quinoa production has three main destinations, local market, informal export market and the international market (Figure 2) for its two kinds, sweet and Royal.



Source: Altiplano Agricultural Technological Development Foundation (FDTA), CAF.

Figure 2. Market structure of quinoa in Bolivia – 2007

Quinoa's international market is formed mainly by developed countries where the United States, France, Holland, and Germany, represented 81% of Bolivian exports in 2007 (Figure 3). Nowadays, this market trades mainly organic quinoa (90% of the transactions), and in 2007 prices were around 1.280,0 \$us/tm. The transition from conventional to organic occurred in the second half of the 90s along with the organic consumer movement in developed countries responding to concerns on the environment and health.



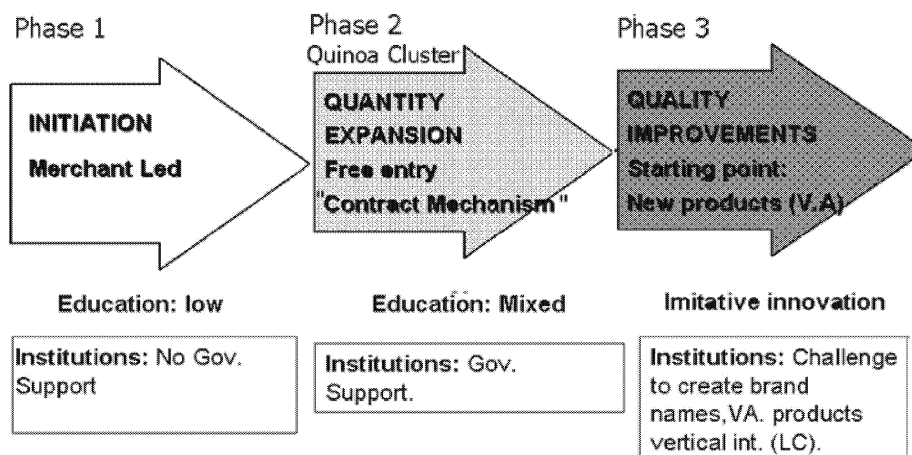
Source: Bolivian Trade Promotion Organization (CEPROBOL)

Figure 3. Destinations of Bolivia's quinoa exports – 2007

2.2 Quinoa cluster in Bolivia and commercial interaction

Different actors participate in the quinoa cluster; the main chain consists of providers of raw materials and equipment, farmers, intermediaries, the agro-industry, brokers, wholesalers and retailers (Crespo, 2001). It is also supported by services given by government offices, NGOs, international aid agencies, agencies for technical assistance, research and development, and export promotion, and by private organizations such as issuers of certification, local and international transportation, and financial services among others.

It is important to clarify that the agro industry (Figure 4) of the quinoa cluster in Bolivia is formed by private companies and cooperatives or associations of farmers which are known as OECAs. The two groups have a different business perspective: OECAs are more oriented toward social welfare and private companies are more market-oriented.



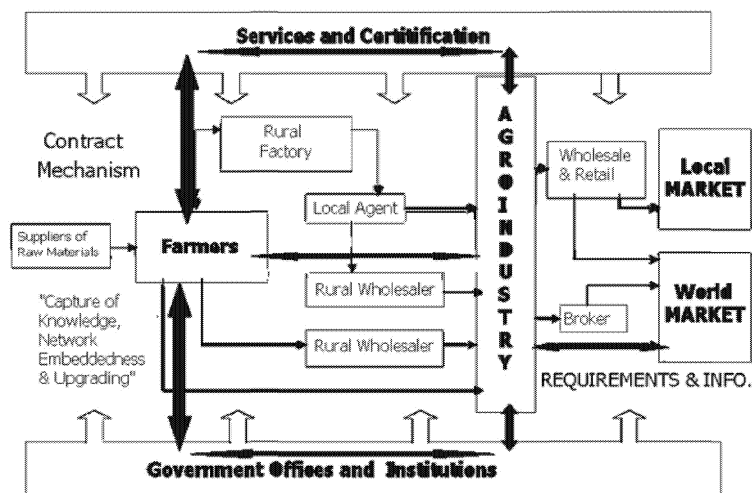
Source: Author's own elaboration based on Sonobe and Otsuka (2006).

Figure 4. Quinoa cluster: endogenous model of industrial development

Since its creation in 1985, the quinoa cluster structure has been buyer driven (Caceres, 2005). Local producers did not possess the know-how to export their products to developed countries. Therefore, the vertical and horizontal coordination in the cluster was and still mainly is organized by world importers.

Initially, importers started to coordinate its supply chain primarily through OECAs until 1999. That phase was followed by the expansion of the organic products and the insertion of new private companies in the agro-industry. Thereafter importers increased its interaction with private companies and they became key players in the supply chain (Laguna, Caceres, and Carimentrand, 2006). This new phase (Figure 4) also marked the consolidation of “contract farming” as the mechanism that connect in a direct way agro-industry’s private companies and farmers in the rural areas (Caceres and Carimentrand, 2004). This new structure started to expand in 2000 and represented 70% of the volume of exports to international markets in 2004. Moreover, under the contract mechanism Bolivia’s exported volume of quinoa increased 5 times during 2002-07.

The group of companies that engaged in international business (capture of knowledge) and also directly related with farmers through the “contract mechanism”, were able to guaranty a stable supply, and create a circle of trust (network embeddedness) between them and their providers and clients. These firms guide and help their suppliers providing them with services to guaranty the product quality required by the international market (upgrading) (Figure 5). Farmers received a harvest contract and different services like the guide to obtain organic product certification, technical assistance, and finance to purchase equipment (Laguna, Caceres, and Carimentrand, 2006).



Source: Author's own elaboration based on Crespo (2001)

Figure 5. Supply chain of quinoa under the contract mechanism

3. Strategy of empirical analysis - data and methodology

Our empirical analysis depends on the dataset from a survey that collected data within a contract farming project with regard to individual information of farmers. The project was supported by an international fund and a private firm in order to help farmers of Bolivia's Altiplano to supply quinoa according to new market requirements negotiated in international markets (organic production, etc.). Based on this framework, the program, which started in 2004, induced farmers to embrace the contract mechanism and to establish a strong relationship with the private company.

The project had 313 participants, and for the survey a random sample of 99 directly associated quinoa farmers distributed in 3 zones was taken. The survey, that was made by a consulting company in 2008, also included a control group of 74 not participant quinoa farmers. In total, responses of participants and not participants were 173. Information at the farmers' level was complemented by interviews to existing agents that directly or indirectly participate in the cluster network in the field of quinoa production, processing and marketing.

Based on this information, two variables were estimated to depict the farmer's relationship with the private export company. We test the hypothesis that farmers with a contract (client) would have higher levels of family income, consumption, and capital accumulation, and that those benefits also have to do with the years of having the contractual relationship. The underlying assumption is that, by having a direct contract with a company linked to international markets, farmers become more efficient in the use of their productive resources, and a longer experience in such a relationship stabilize farmers' economy leading also to consumption smoothing. The variables used in the empirical analysis are listed in Table 2.

We first run a multivariate regression using OLS method to capture the influence of the contractual relationship on income. It is followed by the logit models that analyze the effect on farmers' behavior in capital accumulation and consumption upgrading.

Table 2. Variables list

Variables	Description
PRICE	Price of quinoa (Bs.) for 1 qq. (1 quintal=100 pounds)
VEHICLE	Dummy for who owns a car
INFRAPROD	Dummy for who owns warehouse, storage infrastructure
PROD2007	Quantity of production of quinoa (qq.)
AREA2007	Area of production of quinoa (ha)
INCOME2007	Income from production (PRICE*PROD2007)
PRODUCTIVITY2007	PROD2007/AREA2007
FLIAPERCAPITA2007	INCOME2007 divided by the number of family members
REAL2007	Dummy for producing high quality quinoa
ORGANIC2007	Dummy for producing organic quinoa
TRANSITION2007	Dummy for being in the initial step for organic production
CIA	Dummy for being the client of the company
YEARSCLCIA	Years of having contracts

Source: Author's own elaboration based on the survey.

4. Results of the econometric analysis

4.1 Empirical evidence of the influence on farmers' income

Results of the quantitative data reveal that farmers under the contract mechanism, on average, had higher income than other farmers. The model I reported in Table 3 takes the price of 1 qq. of quinoa as a dependent variable to examine the correlation with several independent variables.

The estimated coefficient of CIA suggests that having a contract with the private company added 25 monetary units (Bs.) to the price of 1 qq. of quinoa as the reward for the adjustment to market requirements. Coefficients of TRANSITION2007 and ORGANIC2007 respectively indicates that the producer will get additional 27 Bs. if he is in the process of obtaining certificate, or 23 Bs. if the product has been already certified as organic. This reveals that “contract mechanism” create incentives to attract framers and support their initial step of adaptation to international market requirements modifying production costs from conventional to organic. Hence, in total the price could be around 48-52 Bs. higher for contracted quinoa farmers.

Table 3. Determinants of farmers' income for 1 qq. of quinoa

	Model 1 PRICE2007 (Bs.) Coefficient	
PROD2007	0.017 (0.006)	***
REAL2007	44.408 (25.819)	*
TRANSITION2007	27.619 (11.991)	**
ORGANIC2007	23.361 (9.366)	**
CIA	25.054 (10.389)	**
YEARSCLCIA	2.821 (1.877)	
Constant	108.121 (33.239)	***
R ²	0.109	

Source: Author's own calculations

Note: Levels of significance 1% ***, 5% ** and 10% *. Standard errors are in parenthesis.

Moreover, since international markets demand high quality products, famers were also induced to produce quinoa's “Real” variety, which has a better nutritional balance, receiving additional 44 Bs. Years of relationship with contract does not have statistically significant impact on the price received by the producer.

4.2 Empirical evidence of the influence on farmers' family income

As it was described, the possession of land in the Altiplano has been historically fragmented and quinoa famers only have access to small areas of production. Furthermore families in the region are commonly large. The survey's average was 4 members per family and quinoa's production income family per capita was Bs.12,823.38 (US\$1,705.23).

In model 2 (Table 4), dependent variable FLIAPERCAPITA2007 was regressed on the area of production, its productivity, and an interaction variable that related the area of production with the years of the relationship with a contract, which depict the "contract mechanism". The results show, that the dependent variable FLIAPERCAPITA2007 had a statistical positive relation with this mechanism, where additional years of the relation with a contract, between farmers and the private company, support confidence and promote expansion of the area of production influencing positively on farmer's family income. One additional hectare of quinoa increases Bs. 1,146.89 of per capita income.

Table 4. Determinants of quinoa producers' per capita family income

	Model 2 FLIAPERCAPITA2007 Coefficient	
AREA2007	1146.891 (99.573)	**
PRODUCTIVITY2007	529.094 (236.842)	**
AREA2007*YEARSCLCIA	70.880 (22.256)	**
Constant	-10503.350 (3151.535)	***
R ²	0.850	

Source: Author's own calculations

Note: Levels of significance 1% ***, 5% ** and 10% *. Standard errors are in parenthesis.

4.3 Empirical evidence of the influence on farmers' consumption level

Regarding consumption level, the analysis revealed that the variable for the years of the relationship with a contract (YEARSCLCIA) contributed positively to the observed possession of a vehicle adjusting for FLIAPERCAPITA2007 (Table 5).

Table 5 Determinants of the possession of vehicles

	Model 3 VEHICLE		
	Coefficient		Marginal Effect*
FLIAPERCAPITA2007	3.23e-5 (1.57e-05)	**	1.73e-5
YEARSCLCIA	0.170 (0.079)	**	0.091
Constant	-0.506 (0.208)	**	
Log likelihood	-111.54		
McFadden R ²	0.070		
Total Observations	173		
Prediction - Success (%)	57.65%		

Source: Author's own calculations

Note: Levels of significance 1% ***, 5% ** and 10% *. Standard errors are in parenthesis.

*Marginal effect on the probability that farmers will buy a vehicle.

*Marginal effects of continuous variables were calculated at the means of the data.

With time farmers, under the contract mechanism, “guarantee”, to a certain level, their income and they feel more secure of them. Thus, farmers that kept their relation with the private company with a contract had higher levels of consumption than those in traditional schemes. Table 5 shows that additional 1 more year of the relationship raise the probability of having a vehicle by 9%.

4.4 Empirical evidence of the influence on farmers' capital accumulation

The analysis for capital accumulation (Table 6) described the relation of investing in productive infrastructure with the independent variable which depicts the contract mechanism adjusting for area of production.

Table 6. Determinants of the possession of productive infrastructure

	Model 4 INFRAPROD		
	Coefficient		Marginal Effect*
AREA2007	0.050 (0.019)	**	0.030
YEARSCLCIA	0.252 (0.092)	***	0.151
Constant	-0.635 (0.246)	**	
Log likelihood	-106.521		
McFadden R ²	0.107		
Total Observations	173.0		
Prediction - Success (%)	65.90		

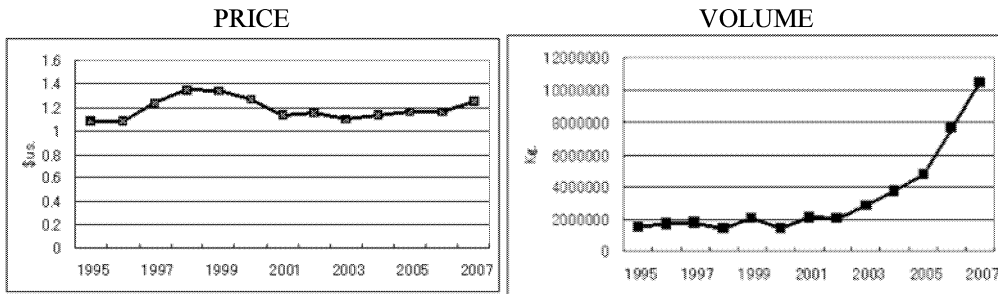
Source: Author's own calculations

Note: Levels of significance 1% ***, 5% ** and 10% *. Standard errors are in parenthesis.

*Marginal effect on the probability that farmers will invest in productive infrastructure.

*Marginal effects of continuous variables were calculated at the means of the data.

Model 4 reveals that the years of the relationship with a contract (YEARSCLCIA) influenced positively in the adoption of productive infrastructure. It shows also that additional 1 more year in the relationship with a contract raise the probability of investing in productive infrastructure by 15 %.



Source: Author's own elaboration based on CEPROBOL

Figure 6. Exports 1995 -2007

Since the relation between farmers and the company linked to international markets, is direct, without local intermediaries, the firm in order to avoid moral hazard problems repeatedly buy from their own group of suppliers “guaranteeing” to a certain level a long term market for their products, knowing that increases of quantity in local production would not affect international demand price (Figure 6), thus the proximity and the lasting relation with the private company promote quinoa production expansion and influenced the adoption of productive infrastructure (a capital accumulation scheme).

5. Summary and remarks

In the quinoa cluster in Bolivia, through the “contract mechanism” rural farmers related with private firms, had accessed to a set of services to adapt their supply to international market requirements, receiving international market information and its benefits (a capital accumulation scheme). Through this mechanism rural quinoa farmers increased their income, level of consumption and capital.

The study also revealed that in the Bolivian quinoa cluster, private firms had a positive role as “connectors” to international market benefits for rural famers. Access to information (capture of international market knowledge) was possible through the contract mechanism, allowed quinoa farmers and the agro industry to be closely related (network embeddedness), it and to produce market oriented products (upgrading). Thus a stable supply chain for the world market is now been provided.

Based on these remarks we conclude that the direct interaction of farmers with private companies linked to international business not only brought income benefits for the companies, but also “quinoa famers” improved their income level with the overall development of the industry, which resulted in a positive impact in local development.

As a policy implication of this document, it would be advisable that cooperation oriented to reduce poverty would increase its funding to this kind of scheme. The “new”

scheme should include the participation of private companies as links between the international market and rural farmers. Where international market linked firms through the “contract mechanism” could transfer international market knowledge to rural farmers, and the proximity of the relation would promote international market oriented upgrading in their supplying farmers. Moreover the scheme would be sustainable since international business will pull local development, linking rural farmer with international market benefits.

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Saying, “Amen: Blessing, and glory, and wisdom, and thanksgiving, and honor, and power, and might be unto our GOD forever and ever. Amen.” Revelation 7:12

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