

Finance Utilization and Chili Contract Fulfillment

Managing Risk in Agriculture

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Section III

Climate Change, Risk and Risk Management

Another issue confronting smallholders and farmers in Western economies is climate change risk. The variability in weather conditions and climate risk are hard to predict, but they have serious implications for farming businesses and poor households in particular. Thus, producers need to account for climate risk when choosing risk management strategies in farming. Having formed an empirical framework for measurement of risk attitudes and risk preferences using various methods described in Section II, we move forward to a better understanding of the tools that smallholders can use to mitigate risk. These tools include contract farming, input usage, efficiency and productivity. Using farm-level studies from developing, emerging and other economies, the final section of this book details emerging climate change risks, perception of climate risks, adaptation mechanisms, natural disasters and risk management tools that farmers use.

Chapter 14 argues that most farmers in developing countries face negative cash flows during planting and growing periods due to various reasons, including weather variability, poor crop harvests and low profitability. Thus, they need credit to engage in contract farming. The authors investigate finance utilization from different sources and contract fulfillment among

chili farmers in Indonesia. Chapter 15 discusses the emerging climate change risks and calls for climate resilience assessments of smallholder farming systems in developing countries. To that end, the chapter argues for a context-specific framework for assessing the climate resilience of semi-arid farming systems in India and evaluating the framework's relevance.

Chapter 16 discusses perception of risk as a prerequisite for adopting adaptation strategies for mitigating the effects of climate change. Production systems need to adopt climate-smart agriculture and mitigation practices to help foster climate resilience, such as improved cultivars that are resistant to pests and climate conditions (droughts/excessive rainfalls). The chapter assesses farmers' risk perceptions of climate change and how they relate to the use of agronomic practices to combat the effects of weather variability.

Natural disasters like earthquakes significantly affect rural populations and farming systems. Disaster's indirect effects on savings and production choices are less understood in the literature. Risk preferences play a significant role in determining economic options, such as savings and production choices after natural disasters. Chapter 17 uses lottery games in Peru to assess the effects of natural disasters on farmers' risk aversion in the affected and unaffected areas.

Recent decades have witnessed changes in precipitation and regional and global temperatures. To become resilient to climate change,

rural communities, particularly farming communities, need help bolstering their adaptive capacities. Using household survey data collected from China, Chapter 18 assesses the impacts of climate change adaptations on wheat farmers' exposure to risk.

Several technological and agronomic options can partially offset climate change's adverse effects on agriculture and agriculture-based livelihoods. Crop diversification is a risk management strategy used by farmers in developing and emerging economies. Crops differ in their response to climate change, and risk-averse farmers often choose a portfolio of crops with low-correlated returns. Chapter 19 evaluates crop diversification's potential for improving system productivity and reducing its sensitivity to climate change. The authors use a spatially disaggregated district-level panel dataset and apply a moment-based specification of the stochastic production function.

The intensity and frequency of extreme weather events have risen due to anthropogenic climate change. Climate change is more apparent in some regions than in others. Temperatures in China, for example, have risen faster than the average temperature globally.

Volatile weather and adverse weather events increase production risks and reduce yields and farm profitability. The use of microcredit in response to climate change also has attracted considerable attention recently. Consequently, Chapter 20 shows linkages between extreme weather events and apple farmers' demand for credit in six counties of China's Shaanxi province.

Agricultural practices evolve to match the prevailing climate; thus, climate change will significantly affect the farming sector. Timely adaptation is vital for efficient, economically sustainable production in the future. Farmers are well motivated to seek a better understanding of changes in weather patterns relevant to them. However, when farmers use weather/climate information to make production decisions they may either be depending on subjective climate information based on first-hand experiences and feelings or on objective data as might best be measured by official statistical sources. Chapter 21, using a natural experiment in the United States, investigates how human perceptions and beliefs about climate change adapt after experiencing an extreme weather event.

14 Finance Utilization and Chili Contract Fulfillment

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Abstract

This study investigates the relationship between finance utilization from different finance providers and contract fulfillment rates in Indonesian chili farms. The contract fulfillment rate was calculated as the ratio of the quantity of chili delivered to the trader to the quantity of chili defined in the contract. Furthermore, the contract fulfillment rate was regressed on the variables reflecting the availability of finance and socio-economic factors, using a censored regression model. Results from personal interviews with 102 chili farmers who had a written contract with a trader show that the farmers generally had a low contract fulfillment rate, i.e. 57%. The contract fulfillment rate was positively associated with in-kind finance utilization from farmers' associations, but negatively associated with subsidized credit utilization from banks and flexible payments of inputs to agricultural input kiosks. The findings suggest that policymakers and value chain actors may stimulate in-kind finance programs offered by farmers' associations to improve contract fulfillment and thereby food supply continuity.

14.1 Introduction

Contract farming has advantages for farmers, such as a guaranteed market and farm technical assistance (Brambilla and Porto, 2011). These advantages improve productivity and income (Sharma, 2008). For firms further downstream in the chain, contract farming provides benefits with regard to assurance and stability of raw produce (Key and Runsten, 1999; Singh, 2002). Furthermore, contract farming benefits farms in reducing investment cost, conflicts with landowners and labor issues (Saptana *et al.*, 2006).

An increasing number of agribusiness firms and smallholders are involved in contract farming in Indonesia. Previous studies on contract farming

in Indonesia have shown that it helps farmers increase their farm efficiency (Fauziyah, 2010) and productivity (Manzilati *et al.*, 2010). Productivity increases because farmers need to work more carefully and follow the planting procedures detailed in the contract. Furthermore, farmers get more useful knowledge from the practice of contract farming compared to focusing solely on extension programs (Manzilati *et al.*, 2010).

Key and Runsten (1999) have shown that production costs from crops under contractual arrangements are much higher than the costs of traditional crops, since the contract often requires specific use of inputs and skilled labor. Hence, their study suggests that finance is very important to help contract farmers produce

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crops that follow the requirements in the contract. Furthermore, the majority of farmers face negative cash flows during planting and growing periods (Bozoglu and Ceyhan, 2007). Therefore, they need finance to purchase inputs prior to harvesting (Angelucci and Conforti, 2010).

Finance can be accessed from different sources; each can be expected to provide specific agricultural inputs. For instance, farmers can seek credit from banks, money lenders, relatives, cooperatives (Pham and Lensink, 2007; Armendariz and Labie, 2011), micro finance institutions (MFIs; Kaino, 2005; Bastin and Matteucci, 2007) and development programs (Pham and Lensink, 2007). Farmers also can obtain financial assistance through government subsidies. Subsidies are provided for agricultural inputs, such as fertilizers and seeds, and for interest on credit (Dorward and Chirwa, 2011; Wulandari *et al.*, 2017). Despite the important role of finance in fulfilling the contract requirements, to the best of our knowledge, the effect of finance utilization from different sources on contract fulfillment has not yet been studied.

This study aims to analyze the role of finance sources in contract fulfillment rates in Indonesian agriculture. Finance providers are banks, MFIs, farmers' associations, traders, agricultural input kiosks and other sources such as relatives and friends. This study focuses on chili farms because contract farming plays an important role in the chili value chain (Rudiyanto, 2014; Tsurayya and Kartika, 2015). Through contracts, farmers are assured of prices (Oelviani, 2013). Chili contracts specify the price paid to farmers and the local market conditions under which the price can be changed. If the price in the local market is higher than the contract price, then the price is adjusted accordingly. Apart from prices, contracts typically specify the chili variety and the number of chili plants that need to be grown. Contracts also specify the quantity of chili that has to be delivered (i.e. fixed at 600 g per plant).

The results of this study show that the farmers generally had a low contract fulfillment rate. Finance utilization in the form of in-kind finance provided by a farmers' association seemed to play an important role in stimulating the continuity of food supplies, indicated by a positive relation to the contract fulfillment rate. In contrast, subsidized credit utilization from a bank and flexible payments of inputs to an agricultural

input kiosk had a negative association with the contract fulfillment rate. Education also had a positive association with the contract fulfillment rate. The results provide insight into the role of different finance sources in contract fulfillment; these insights are useful for policymakers, finance providers and supply chain actors in Indonesian agriculture. For policymakers, the results of this study can help in designing policy to enhance the availability of finance to stimulate the continuity of food supplies. For finance providers and supply chain actors, such as traders and farmers' associations, this study provides insight into the effect of their financial provisions on supply chain continuity.

The rest of this chapter is organized as follows. Section 14.2 describes the sources of finance available to farmers in Indonesia. Section 14.3 describes the methods used and an explanation of how the contract fulfillment rate is calculated. Results on contract fulfillment rates and the effects of finance utilization on contract fulfillment rates are described and discussed in Section 14.4. Section 14.5 provides conclusions and policy implications.

14.2 Sources of Finance

Indonesian farmers can access finance from many different sources. Credit is supplied by banks, MFIs and other sources, such as friends or relatives (Machmud and Huda, 2011). In-kind finance is provided by farmers' associations and traders, whereas agricultural input kiosks offer a scheme of flexible payments for inputs (Wulandari *et al.*, 2017). A full description of the finance sources available to farmers in Indonesia is provided in Wulandari *et al.* (2017).

14.2.1 Banks

Farmers can access finance from banks. They can also apply for finance under a subsidized credit program offered by banks in collaboration with the Indonesian government; an example is the program of microcredit loans (*KUR-Kredit Usaha Rakyat*). The KUR is designed to help farmers obtain credit, especially farmers who have no collateral (Agricultural Ministry of Indonesia, 2013).

Banks favor farmers who have contracts with a firm because contracts can act as a guarantee (with a so-called *avalis*) to obtain credit from banks (Tutik *et al.*, 2014).

14.2.2 Micro finance institutions

Farmers can also apply for commercial credit offered by MFIs. Farmers are required to register as members of an institution. Credit from such institutions benefits small farmers who cannot obtain credit from banks.

14.2.3 Farmers' associations

Farmers' associations channel government aid to farmers who are members of the associations. The Indonesian government provides associations with cash aid through the rural agribusiness development program (*PUAP-Pengembangan Usaha Agribisnis Perdesaan*), which targets farmers' associations to motivate farmers to increase production. The government also provides them with seed and fertilizer, farm equipment, and subsidies to purchase seed and fertilizer. The associations then distribute the finance obtained from the government to their members. Finance is provided in-kind, i.e. by distributing agricultural inputs to their members. In return, some farmers' associations require their members to sell their produce to traders.

14.2.4 Traders

Some traders provide in-kind finance to farmers with a sales contract, which is set by the traders and farmers together. In-kind finance includes seeds, fertilizers and pesticides. The contract specifies the rules for production, the amount of produce to be delivered and prices. In case of non-performance, farmers' contracts are terminated (Saptana *et al.*, 2006).

14.2.5 Agricultural input kiosks

Some agricultural input kiosks provide finance to farmers by selling inputs, such as seeds, fertilizers

and pesticides, for a flexible payment. This means that farmers can pay for the input after 1 week and 1 month of the purchase. Some kiosks allow farmers to pay after harvesting, as long as the farmers agree to sell the harvest to the kiosk.

14.2.6 Others

Relatives and friends are other finance providers. Informal sources of finance are traditionally important for rural people, as they supply short-term credit for urgent needs, which are usually not met by the banks and MFIs (Duong and Izumida, 2002).

14.3 Research Methods

14.3.1 Survey and data

To measure the contract fulfillment rate and analyze its relation to finance utilization and other socio-economic variables, structured questionnaires for farmers were prepared and pre-tested to evaluate consistency and clarity. The questions covered four main areas: (i) socio-economic characteristics of farmers; (ii) finance obtained from different sources during the growing season; (iii) quantity of chili that farmers agreed to supply; and (iv) quantity of chili delivered to the trader.

The survey was conducted from January 2014 to August 2015. Data were collected in person from farmers who had a written contract with a trader or with a farmers' association. A total of 102 farmers were surveyed in West Java and Central Java.

Within Java, study sites were selected based on the importance of chili production. The two provinces in Java with the largest area were selected as study sites. According to data from the Central Bureau of Statistics in Indonesia (BPS, 2013), chili production occurs mainly in the provinces of West Java and Central Java. Farmers were randomly selected prior to the interviews, and oral consent was obtained from the farmers because some participants had little schooling. Oral consent also was used by Reyes-Garcia *et al.* (2016).

14.3.2 Analytical methods

The contract fulfillment rate was calculated as the ratio of the quantity of chili (kilograms) actually delivered to the trader to the quantity of chili (kilograms) defined in the contract. The fulfillment rate, therefore, is between 0 and 1. Next, the contract fulfillment rate was regressed on the variables related to the availability of finance and socio-economic factors, using a censored regression model. Censored regression is a useful tool for obtaining unbiased estimation of a regression model with a limited dependent variable (Tobin, 1958), i.e. in this case the rate cannot be less than 0. The generic form of a censored model (Verbeek, 2004) is

$$y_i^* = x_i \beta + \varepsilon_i, i = 1, 2, \dots, N \text{ (102 farmers)} \quad (14.1)$$

The dependent variable is y_i^* , the contract fulfillment rate for farmer i , the independent variables (x_i) are variables reflecting finance and socio-economic variables, and ε_i is the error term. Finance is measured by dummy variables that take the value 1 if the farmer obtained finance from commercial credit (*commercial credit*) and subsidized credit (*subsidized credit*) from banks, commercial credit from micro finance institutions (*mfi*), in-kind finance from farmers' associations (*farmers' association*) and traders (*trader*), flexible payment of inputs to agricultural input kiosks (*kiosk*) and finance from other sources of finance (*other*), such as from relatives and friends.

If a farmer relied on multiple sources of finance, each source was accounted for. For instance, if a farmer obtained finance from a farmers' association, an agricultural input kiosk and a friend, then the dummy variables *farmers' association*, *kiosk* and *other* took the value 1. The model also included socio-economic factors: age, education, farming experience, farm size, quality and intercropping. Age (*age*) is measured as the age of the farmer in years. Education (*education*) is measured as the number of years of the farmer's formal education, and farming experience (*farming experience*) is the number of years the farmer has experience in chili production. Farm size (*farm size*) is measured as the number of hectares the farmer used for producing crops. Quality (*quality*) is represented by a dummy variable,

which takes the value 1 if the farmer faced at least one rejected delivery because the quality did not meet the standard required by the contract. Intercropping (*intercropping*) is a dummy variable, which takes the value 1 if the farmer planted any other crops jointly with chili on his or her farm.

Finance is expected to increase the contract fulfillment rate because it facilitates better access to inputs and technologies. Finance in the form of commercial and subsidized credit from banks, as well as commercial credit from MFIs, can be used for the following activities: buying irrigation equipment that can increase production (Wossen *et al.*, 2014), investing in agricultural equipment or renovating old buildings (Brummer and Loy, 2000) or obtaining more inputs or better quality inputs (Girabi and Mwakaje, 2013). All these activities are expected to increase the contract fulfillment rate. In-kind finance from farmers' associations (Lamprinopoulou *et al.*, 2006) and traders (Schipmann and Qaim, 2011) and flexible payment of inputs to agricultural input kiosks may help farmers obtain inputs that are used throughout the growing season, such as fertilizers and pesticides. Better access to these inputs can increase farm production and subsequently the contract fulfillment rate. Finally, finance from other sources, including family and friends, may help farmers purchase agricultural inputs during planting and growing periods, as the majority of farmers are faced with negative cash flows during these periods (Bozoglu and Ceyhan, 2007).

However, the effect on contract fulfillment of finance utilization from all sources of finance may be obscured when farmers exhibit opportunistic behavior and deliberately fail to comply with the contract requirements. This occurs when farmers sell output to the market in situations when the market price is higher than the contract price (Gow and Swinnen, 2001). Furthermore, the effect of in-kind finance utilization may be obscured when the in-kind finance is not used to benefit the crop. Gow and Swinnen (2001) showed that farmers were selling inputs obtained through in-kind finance rather than using them on their land. Similarly, the effect of credit utilization may be obscured if farmers do not use the credit for their crops. Evidence shows that some farmers used credit for other purposes, such as renovating a house or buying a motorcycle (Rizal and Zulfa, 2012).

The socio-economic variables age, education, farming experience and farm size are all expected to increase the contract fulfillment rate. Older farmers are expected to have more financial resources than younger farmers (Lucas and Pabuayon, 2011), which may enable them to more easily obtain inputs that can increase production, leading to an increase in their contract fulfillment rate. More educated farmers are expected to make better use of new technology than less educated farmers (Ghimire and Huang, 2016). Lastly, more experienced farmers and those with larger farms have better opportunities than less experienced farmers and those with smaller farms to adapt to climate change by using crop diversification (Gebrehiwot and van der Veen, 2013), which may lead to increased production and a better contract fulfillment rate.

Before carrying out the regression, all independent variables, except for the dummy variables, were standardized to prevent scale effects of the β coefficients. Standardization was performed by subtracting the variable-specific mean from each variable and dividing the result by the standard deviation (UCLA, 2015). Homoskedasticity was tested using the Breusch–Pagan test, and multicollinearity was checked by calculating the variance inflation factors (VIF) for each variable. Following Rook *et al.* (1990), no multicollinearity was found in the model as all VIF values were well below 10. Furthermore, the presence of reverse causality was checked especially in the variables reflecting finance utilization. For instance, in the case of a contract with a farmers' association, a higher contract fulfillment rate might in turn lead to better access to finance from the farmers' association.

The definitions and summary statistics for all variables are presented in Table 14.1. The table shows that a large group (52%) of chili farmers obtained subsidized credit from a bank, whereas only few obtained commercial credits from a bank (5%) or from an MFI (2%). Furthermore, 13% of the chili farmers obtained in-kind finance from a farmers' association and 27% from a trader. Flexible payment of inputs to an agricultural input kiosk had been obtained by 13% of the chili farmers, and one-fifth of the chili farmers obtained finance from other finance sources. Farmers averaged 40 years old with 7 years of formal education and 10 years of farming experience. Table 14.1 also shows that 12% of the respondents had had at least one

delivery rejected. Furthermore, a large group (69%) of the farmers grew other crops together with chili during the 2013 growing season. Table 14.1 also shows that the average contract fulfillment rate was 57%.

14.4 Results

The results of the censored regression of contract fulfillment rate on the variables reflecting finance utilization and socio-economic factors are presented in Table 14.2. The results show that the relationship between the contract fulfillment rate and finance utilization varied across finance providers. The utilization of subsidized credit negatively associated with the contract fulfillment rate, implying that the contract fulfillment rate was, *ceteris paribus*, lower with finance utilization from this source. A possible explanation is that subsidized credit might target a special program for smaller farmers who may have limited experience in chili production. These farmers may be less skilled in producing chili according to the quantity and quality requirements specified by the contract. Another explanation is that the subsidized credit may have been used for other activities. Riaz *et al.* (2012) found that farmers in Pakistan did not use credit for crop purposes but for other activities, such as household needs or construction of a house, thereby not benefitting overall farm production.

As expected, finance utilization from a farmers' association had a positive association with the contract fulfillment rate. This result suggests that the contract fulfillment rate is higher when in-kind finance is obtained from farmers' associations. By being a member of an association, a farmer can benefit from the provision of inputs (Lamprinopoulou *et al.*, 2006), which enables farmers to increase their production and fulfill their contracts. However, finance utilization from a trader had a negative association with the contract fulfillment rate, although the association is not statistically significant. The negative association might be because of a side-selling problem. Farmers might behave opportunistically because there were no strict rules that applied sanctions in a contract when farmers did not sell their products as agreed in the contract (Prihadi *et al.*, 2010).

Table 14.1. Definitions and summary statistics of sample respondents (n = 102). (Source: Authors' calculation.)

Variable	Variable definition	Sample mean	
Bank	Commercial credit	1: obtained commercial credit from bank in 2013	0.05
	Subsidized credit	1: obtained subsidized credit from bank in 2013	0.52
Micro finance institution		1: obtained commercial credit from MFI in 2013	0.02
Farmers' association		1: obtained in-kind finance from farmers' association in 2013	0.13
Trader		1: obtained in-kind finance from trader in 2013	0.27
Kiosk		1: obtained flexible payment of inputs to agricultural input kiosk in 2013	0.13
Others		1: obtained finance from other finance sources in 2013	0.20
Age		Age (years)	40
Education		Education (years)	7
Farming experience		Chili production experience (years)	10
Farm size		Farm size (hectares)	1.16
Quality		1: has faced at least one rejected delivery because of quality issues	0.12
Intercropping		1: grew other crops on their chili farms	0.69
Contract fulfillment rate		Ratio of the quantity (kg) of chili actually delivered to the quantity (kg) of chili defined in the contract for the growing season of 2013	0.57

Table 14.2. Coefficients from the censored regression of contract fulfillment rate on variables representing finance utilization and socio-economic factors. (Source: Authors' calculation.)

Variables	Coefficients	Standard errors	
Bank	Commercial credit ^d	0.046	0.165
	Subsidized credit ^d	-0.252	0.116 ^b
MFI ^d		0.290	0.236
Farmers' association ^d		0.375	0.131 ^a
Trader ^d		-0.188	0.119
Kiosk ^d		-0.307	0.108 ^a
Others ^d		0.072	0.086
Age (years)		-0.030	0.036
Education (years)		0.070	0.041 ^c
Farming experience (years)		0.013	0.037
Farm size (hectares)		-0.053	0.040
Quality ^e		-0.057	0.125
Intercropping ^f		-0.006	0.078
Constant		0.720	0.119

Notes: ^aSignificant at 1%, ^bsignificant at 5% and ^csignificant at 10% level.

^dDummy variable representing whether the respondent had obtained finance from the finance provider during 2013; 1 if yes, 0 otherwise.

^eDummy variable representing whether the respondent has faced at least one rejected delivery because of quality issues; 1 if yes, 0 otherwise.

^fDummy variable representing whether the respondent grew other crops on their chili farms; 1 if yes, 0 otherwise.

Finance in the form of flexible payments to an agricultural input kiosk had a negative association with the contract fulfillment rate, which indicates that farmers who obtained finance from the kiosk had, *ceteris paribus*, a lower contract fulfillment rate. This might be because farmers with limited experience in chili production used the kiosk as a last option to obtain finance, i.e. they had difficulty obtaining finance from formal finance sources, such as banks (Supriatna, 2009).

Most socio-economic factors had no statistically significant relation with the contract fulfillment rate. Education, which had a positive relation with the contract fulfillment rate, was the only exception. The positive association is consistent with the prior expectation that more educated farmers have better skills than less educated farmers to use new technology (Ghimire and Huang, 2016), which may increase production and hence the contract fulfillment rate. Reverse causality tests were performed to investigate the relation between statistically significant variables and the contract fulfillment rate. Reverse causality was found between the contract fulfillment rate and finance utilization from commercial banks, farmers' associations and kiosks. Hence, although the relations with finance utilization from these sources were positive, the direction of the causality is unknown.

14.5 Conclusion and Recommendations

This study analyzed the role of finance utilization from different finance providers in the contract fulfillment of chili farmers in Indonesia. Sources of finance included in the study were banks, MFIs, farmers' associations, traders, agricultural input kiosks and other sources. The results show that the farmers in the sample generally had a low contract fulfillment rate, with an average of 57%. Finance utilization from a farmers' association was positively associated with the contract fulfillment rate. In contrast,

subsidized credit utilization from a bank and flexible payments of inputs to an agricultural input kiosk had a negative association with the contract fulfillment rate. Finally, education had a positive association with the contract fulfillment rate.

The results of this study imply that in-kind finance provided by farmers' associations seems to play an important role in stimulating the continuity of food supplies, and thus policies may need to be introduced to focus on enhancing the availability of finance from this finance provider. Although this study was limited to chili farms, the results can be generalized to other types of farms in Indonesia that have similar characteristics and operate under similar types of contracts, i.e. farms that produce annual crops under contracts that specify the quantity of crops to be delivered. An example is potato contracts between farmers and traders (Silvia *et al.*, 2015). The results also can be generalized to countries with conditions similar to those of Indonesia, i.e. countries that have an institutional environment of agricultural value chains similar to Indonesia's and that have a similar farm structure. Examples of countries for which the results may be relevant include countries in South, South-east and East Asia and in sub-Saharan Africa (Eastwood *et al.*, 2010).

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