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A Case Study of a Contract Farming Chain Involving Supermarkets and Smallholders in Thailand*

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ABSTRACT This study explores the implications of supermarket expansion in the developing world for actors, particularly small-scale farmers, along the supply chains, by examining a case from Thailand. Supermarkets exert monopsonistic power by pushing a range of processing and marketing costs on to suppliers and instituting a short-term tendering process among suppliers. The scale of the farming operation is not a barrier to entering the chain, but important financial and social capital investments are necessary. Returns compared to traditional farming can be high, and appear sustainable at least in the medium term.

RÉSUMÉ Cette étude explore les implications de l'expansion des supermarchés dans le monde en développement pour les acteurs, notamment les petits agriculteurs, le long de la chaîne d'approvisionnement en examinant un cas de la Thaïlande. Les supermarchés exercent un pouvoir de monopsone en imposant aux fournisseurs une gamme de coûts de transformation et de commercialisation et en instaurant entre eux un processus d'appel d'offres à court terme. L'échelle de l'exploitation agricole n'est pas une barrière à l'entrée de la chaîne d'approvisionnement, mais d'importants investissements de capitaux financiers et sociaux sont nécessaires. Les retours par rapport à l'agriculture traditionnelle peuvent être élevés et semblent durables, du moins à moyen terme.

Introduction

Dramatic changes have been experienced in food retailing around the world in the last two decades, and these changes have held significant implications for developing country agricultural producers. On the one hand, increasing global procurement of food products has resulted in unprecedented opportunities for developing country farmers to benefit from developed country markets. On the other hand, the increasing "supermarketization" of food retail sectors of developing countries is starting to alter terms on which agricultural producers interact with domestic markets. A particular concern

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has been that small-scale farmers may start to lose ground in terms of supplying within this "new agricultural economy" (Boselie, Henson, and Weatherspoon 2005). However, where small-scale farmers are indeed able to integrate themselves into the new supply chains, the scope for increased value addition in comparison to traditional production raises the possibility of significant livelihood enhancement. Thus, given that the majority of the world's poor live in rural areas and are linked to agriculture either directly or through its multiplier sectors, the ongoing transformation of retail sectors could either contribute to poverty reduction or be an immiserizing development.

These developments have spawned a recent literature on the economics of supermarket expansion in developing countries. Given that supermarket chains typically rely on contract-based delivery rather than spot market procurement of agricultural products, this literature is closely connected to the earlier literature on the development economics of contract farming. Since contract farming can be viewed as an institutional solution to various market failures and imperfections, it may be an important mechanism for agricultural development (Grosh 1994). However, several familiar questions posed before in the literature on contract farming are now being revisited in the context of contracting within supermarket supply chains. To what extent is there a scale bias to contracting? To what extent does participation in supermarket contracting chains result in improved farm-level outcomes? Are such chains sustainable in the medium to longer run?

In this paper, we contribute to this literature by considering a detailed case study of CS cooperative, a contract farming setup in Thailand that produces watermelon for supply to several supermarkets. We present qualitative information from semi-structured interviews with the proprietor, a broker who manages one of the branches, and nine contracting farmers, as well as quantitative questionnaire-based information on a small sample of contracting farmers and a control sample of local non-contracting farmers engaged in traditional crop production. The information is used to shed light on some of the questions posed in the previous paragraph, as well as several other aspects relating to evolving horticultural supply chains in Thailand and their implications for small-scale farmers. Thailand is often held up as a contract farming pioneer. It is also a country that has witnessed substantial penetration into food retailing by both foreign-owned and local supermarkets in recent times. As such, it provides a good setting for discerning patterns and tendencies that may be witnessed in other developing countries in the future. However, the sub-literature on supermarket-led contract farming in Thailand has been disproportionately thin, limited to a handful of studies. Information at the farm household end of the chain is particularly scarce. This paper aims to contribute to redressing this lack.

We proceed by briefly describing the history of contract farming in Thailand and outlining supermarket expansion in the country. This is followed by a description of the case study setting and the methodology for data collection. We then describe insights gained from qualitative interviews, followed by a section analyzing the quantitative data collected. The final section concludes. Instead of reviewing the relevant literature in a separate section at the outset, we have found it desirable instead to weave such literature into relevant points in the various sections.

I. Contract Farming and Supermarket Expansion in Thailand

Concomitantly with, and in significant part due to, its rise as a world leader in processed food exports, Thailand has experienced a proliferation of contract farming schemes since the 1970s as means for agribusiness firms to procure a timely and assured supply of their product. Steady urbanization and a rise in urban Thai incomes have also contributed by creating strong local demand for processed and non-traditional food products. Glover (1992) noted that Thailand had more experience in contract farming, and for a wider range of crops, than any other country in Asia. Poultry, pineapple, and sugar cane are some prominent examples, but the Thai contract production experience ranges from rice to vegetable seed to dairy and seafood products. Large private sector entities, such as the Charoen Pokphand (CP) Group in the case of poultry, have often driven contract farming schemes. The Thai government has also played a significant role, explicitly integrating contract farming into national plans, providing extension services, and pushing financing bodies to provide rural credit and underwrite agribusiness schemes. In some cases, help from the government has been the predominant reason for the viability of contract farming schemes. For example, Singh (2006) notes in a case-description of maize contract farming operated by CP in the 1990s that the Bank for Agriculture and Agricultural Co-operatives (BAAC) recruited growers, channelled credit, distributed inputs from CP, and took care of the administrative paperwork, allowing CP and farmers to benefit while BAAC shouldered most of the risk.

Several schemes have enjoyed sustained success and have also benefited small scale farmers. Benziger (1996) in his study of contract farming for high value crops in the northeast finds that the schemes have transformed the fortunes of participating small farmers by reducing risk, raising the ceiling on profitability of crops, and making inputs more easily available. Rosset, Rice, and Watts (1999) in their study of hybrid tomato seed production note that the contract scheme included numerous small farmers cultivating less than 1.6 hectares,[1] including functionally landless households, and that the scheme had brought substantial prosperity to their villages. Setboonsarng, Leung, and Cai (2006) find that contracted organic rice farmers in their sample enjoyed significantly larger profit margins than did non-contracted farmers. Sriboonchitta and Wiboonpongse (2008) comment that there is little evidence to indicate that smaller farmers are routinely excluded from contract schemes. However, not all experiences have been positive. There are also several examples of failed contract farming schemes in Thailand.[2] A key potential problem is that regular markets often function too well in Thailand for contract-based production to be sustained. If contract farming can be viewed as an institutional response to input, output, credit, insurance, or information market failures (Key and Runsten 1999), good functioning of such markets tends to

1. In Thailand land is measured in rai; 1 rai = 0.16 hectares. A small farm is less than 10 rai (1.6 hectares).

2. Indeed, at least one author (Baumann 2000) goes so far as to characterize the overall Thai contract farming experience as one of failure.

negate the advantages obtained by contracting. For example, where output markets are functioning well, there is always the danger that contracted farmers may be opportunistic and sell part of their produce on the open market. This has been found to be common around the world (e.g., in Croatia (Eaton and Shepherd 2001), Senegal (Warning and Key 2002), and Mexico (Runsten and Key 1996)). Also, the possibility of agribusiness firms fulfilling demand adequately based on spot markets is better when the output market is functioning well. Note, however, that the evidence on this front is not always clear-cut. Wiboonpongse et al. (2002) provide examples (tomato and potato production in northern Thailand) where contract farming schemes have been sustained despite parallel spot market opportunities.

Contract farming in Thailand is likely to be substantially affected by the ongoing restructuring of the agri-food system as supermarkets advance rapidly into the country's retail market. Modern retailing took root in Thailand in the 70s and 80s in the form of department stores such as Central, Robinson's, and The Mall opening up in Bangkok, catering to an exclusive upper-class customer base (Tokrisna 2004). In the late 80s and early 90s, as the economy boomed, these stores expanded to the Bangkok suburbs as well as other major cities. Convenience store chains such as 7-Eleven (operated by the CP Group) and FamilyMart established themselves. This period also saw the arrival of the first hypermarkets in the form of Makro (CP Group), Big C (Central Group) and Lotus (CP Group). The economic crisis in the late 90s saw these enterprises sold in major part to foreign investors (Tokrisna 2004): Big C to the French Casino Group, Makro to Dutch SHV, and Lotus to UK's Tesco.

Post-crisis recovery has witnessed a rapid surge in expansion of these "modern-retail" businesses. Wiboonpongse and Sriboonchitta (2004) estimate that modern-retail account for 35% of total food retail sales. Reardon and Hopkins (2006) estimate an even higher share, in excess of 50%. There are now over a hundred hypermarket stores in the country. Between 1999 and 2004, Tesco more than doubled its number of hypermarkets, reflecting the pace of change in retailing. Supermarkets (less than 1000 square metres of retail space) such as TOPS have also expanded, and are set to become much more important with the introduction in 2003 of retailer zoning laws unfavourable to hypermarkets. The 7-Eleven convenience store franchise has become ubiquitous, operating over 2500 stores around the country. Tesco is also rolling out its Tesco Express convenience stores.

Needless to say, one consequence of modern-retail expansion has been a steep decline in traditional retail. Another repercussion has been the revamping of supply chains for food products, with significant implications for all actors along the chains, in particular the farmers. For products such as fresh vegetables and fruits, driven by consumer demand for freshness and safety, supermarkets look for consistent produce quality and stable, frequent, and large scale supplies. One consequence of this has been that supplier numbers have typically been reduced, with many supermarkets now preferring to deal with small numbers of relatively large scale "preferred suppliers." For example, Boselie, Henson, and Weatherspoon (2003) note that TOPS Thailand has reduced the number of its produce suppliers from 250 to 60, requiring those remaining to perform a range of value-addition activities such as washing and packaging. Supermarkets also

impose minimum volume requirements and levy a range of direct and indirect charges on suppliers, such as enrolment fees, rebates on annual sales, and additional charges for every new store opened up (Wiboonpongse and Sriboonchitta 2004). All this leads to the smaller suppliers being largely left out of the chain. For example, Ruben, Boselie, and Lu (2007) found that 60% of TOPS' fresh produce is delivered by just five suppliers.

An important development question relates to where this leaves small-scale farmers. It is clear that small-scale farmers are unlikely to have a direct connection to supermarket supply (i.e., be suppliers themselves) unless they can organize themselves collectively to a significant degree and engage professional management to interact with supermarkets. The evidence from Thailand is that supermarkets contracting directly with farmers is rare (Wiboonpongse and Sriboonchitta 2004). Some branches of supermarkets such as Big C and Carrefour source a small amount of supply directly from local farmers, typically smaller scale. This is often done because the supermarket in question wishes to present an image of a company that cares for the local community, and also because of some demand for locally produced goods. The vast bulk of produce is sourced from channels in which there is at least one intermediary between farmer and supermarket. However, this does not necessarily mean that smaller farmers need be left out of the emerging chains. Whilst supermarkets may themselves only deal with large scale suppliers, these large scale suppliers may well source a significant amount of their supplies from other farmers down the chain. Given the precise quantity and quality requirements that they need to fulfil, the suppliers are more likely to contract in some form with the farmers rather than rely on spot markets. The well-known advantages that small-scale farmers possess in certain contract farming situations, such as intensive household labour supply and higher productivity, could then come into play, enabling small farmers to benefit from the new chains. Some authors rightly worry about the exclusion of small farmers (e.g., Ruben, Boselie, and Lu 2007; Reardon et al. 2003). However, in a country such as Thailand, with its long experience of small farmer contract production, small-scale farmers may well benefit from supermarket chains, even if only at the lower end of these chains. In the rest of this paper, we examine the specifics of such a case study.

II. Setting and Data Collection

CS Cooperative is a large supplier of watermelons, located in central Thailand. Although it is in name a "cooperative," it is in reality a wholesale supplier with a single proprietor. CS also supplies oranges, although only the watermelon business is investigated in this study. Both conventional as well as "safe" watermelons are sold by CS. (In Thailand, produce with pesticide residue lower than the maximum residue limit (MRL) is denoted safe, and is officially certifiable as such (Posri, Shankar, and Chadbunchachai 2007).) CS supplies to several supermarkets. Some of the produce is also sold to other vegetable and fruit suppliers through a wholesale market in Bangkok. The watermelons are sourced from several contract farming branches in various locations in Thailand. An intermediary broker is in charge of each of these branches. The brokers act as intermediaries between the proprietor and the contracting farmers. They coordinate

planting and harvest schedules, supply inputs, provide technical information to farmers, collect harvested produce, and arrange for transport to the central CS hub.

Data collection was carried out during January through March 2005. First, a semi-structured interview was carried out with the proprietor of CS Cooperative, probing details about the evolution of the business, the makeup of the chain, the terms of relationship with supermarkets and with farmers, value addition activities, etc. Then, one branch was selected for further interviews and quantitative data collection.

The branch in question is located in Nakhon Phanom province,[3] just across the border from Laos and in proximity to the Mekong River. This branch is of average size in terms of numbers of participating farmers and total watermelon supply to CS, and is hence taken to be reasonably representative of CS branches. More broadly, CS is in many ways typical of private contract farming setups supplying to modern retail businesses in Thailand. It specializes in the production of a small number of high-value products, operates via a broker or quasi-employee system noted as typical by Singh (2006), and has the scale and geographical scope necessary to maintain reliable large supplies to modern retail businesses.

Data collection centred around four villages located along the Songkhram River, a tributary of the Mekong. This is traditionally a rice-growing area, but there is also a significant amount of rubber production in the area, rubber being an export cash crop encouraged by government investment subsidies. Semi-structured interviews were carried out with the single broker in charge of the branch, followed by interviews with a small group of contract farmers. These interviews also helped fine-tune a quantitative survey questionnaire. Following pre-testing, the questionnaire was administered to 30 contracted watermelon farmers. As a comparison group, 30 non-contracted farmers were also surveyed. Watermelon being a fairly specialized crop, finding sufficient non-contracted watermelon producers would have been a very difficult task. The comparison group was thus a sample of randomly chosen non-contracting farmers who were mostly engaged in rice and rubber production.[4]

III. The Anatomy of the Chain

The proprietor of CS Cooperative came to watermelon supply via his earlier occupation as a dealer in agricultural inputs—primarily pesticide, seeds, and fertilizer. He diversified into watermelon supply in 1995, and this business steadily grew in size. In the early 2000s, growing consumer concern over pesticide residue in vegetables and fruit led to strong demand for "safe" products guaranteed to be below pesticide MRLs, and CS Cooperative incorporated a safe range into the watermelon business. Supermarkets

3. A reason for the choice of this branch was its proximity to where the investigators for this research were based in northeastern Thailand.

4. This situation, where the comparison group is engaged in different crops than the contractee group, is fairly common in the contract farming literature, due to the specialized nature of contract crops. For example, Von Braun, Hotchkiss, and Immink (1989) compare contract farmers growing export vegetables with local traditional farmers growing maize and beans in Guatemala. Rice and rubber can reasonably be considered the main alternatives to watermelon in the area.

cater primarily to the urban middle and upper income groups that typically demand safe lines. Lower reliance on pesticide in vegetable and fruit production usually implies highly labour intensive production with significant scouting and monitoring effort. This is best accomplished with the use of household labour. As Key and Runsten (1999) note, household labourers are residual claimants of their labour, unlike hired labourers who are paid on a piece-rate basis. Thus household labour is self-supervising, while hired labour needs monitoring. In labour activities such as pest-control, where the connection between effort and output is difficult to measure, self-supervision is a considerable advantage. As safe lines continue to grow in popularity, supported by supermarket retailing, it is thus possible to see a role for small-scale, household based farmers.

CS supplies to several supermarkets: The Mall, Makro, Carrefour, and Big C. Tesco Lotus is a major hypermarket that CS does not supply, and this is primarily because even for a relatively large supplier like CS, Tesco's supply volume requirements are too high. The total watermelon supply of CS averages around 100 tons per month. Between 2 and 5 tons are supplied in total to the four supermarkets per day, while 2 to 3 tons per day are sold to other sources, primarily wholesalers at CS's site in Bangkok's Talaad Thai vegetable and fruit wholesale market. On average, 55% of total sales goes to the four supermarkets, while 45% goes to other sources.

Each supermarket invites tenders for specified quantities from a pool of preferred suppliers on a weekly basis. With most supermarkets, as long as about 95% of the contracted volume is supplied, the agreed amount is paid fully. For any volume below this threshold, the supermarket only pays the appropriate proportion of the tendered amount. The product has to be delivered to the distribution centre of the supermarket in question, and all transportation, packaging and other costs have to be met by the supplier. Payment is made only about a month after delivery. Significantly, the large hypermarkets that CS supplies to, Carrefour, Makro and Big C, all charge a fee of 10%, a deduction for handling costs and transportation from supermarket distribution centres to stores throughout the country. The Mall, a smaller local supermarket, does not charge such a fee. The proprietor opined that although he often is paid less than he might have made on the open market during the week after a contract has been made, the stable quantities demanded by the supermarkets minimize his business risk, which he sees as a significant advantage for himself as well as others in the chain.

The modus operandi of supermarket procurement described above is consistent with the observations of Ruben, Boselie, and Lu (2007). They note that while preferred supplier arrangements ensure stability and quality of supply (compared to purchase from traditional wholesale markets), the costs of any default are systematically pushed on to producers, through penalties and threat of exclusion from supplier lists if agreed on amounts of produce are not supplied. In the Thai watermelon case, having a group of preferred suppliers ensures stable supplies. Instituting a weekly competitive tendering process enables the supermarkets not only to make short term alterations to demand, but also to exert monopsonistic power and reinforce the threat of exclusion. The exertion of monopsony power is also seen in the numerous costs passed on to the supplier and the handling and transportation fees charged. Ruben, Boselie, and Lu (2007) and Hueth et al. (1999) note that supermarkets may institute input delivery and technical

assistance to enable producers to upgrade their quality. However, no such assistance is provided in the channel that CS supplies. The costs of complying with safety standards associated with the safe certification, including periodic sampling and checking costs, are also to be borne by the suppliers in this case. CS has obtained safe certification through its own efforts, and bears all costs of periodic sampling and testing. Clearly, given the volume requirements, the preferred supplier approach, the pushing of all costs on to suppliers, and the safety certification burden, the chances of small producers being able to directly supply supermarkets are very slim.

We now turn to the lower half of the chain. CS obtains its watermelon supply from several outgrower branches spread around Thailand. This geographical diversification enables CS to spread its production risk and ensure a stable supply. The brokers of various branches are not employees of CS; notionally they are independent businesses that sell watermelon to CS. However, in practice there is strong vertical coordination in this segment of the chain, with such coordination being essential to maintain stable quantity and quality of supply. The brokers sell predominantly, though not exclusively, to the proprietor. They carefully manage planting and harvesting schedules, staggering these between their contracted farmers so that a stable supply can be provided over time to CS. Importantly, the proprietor is also an input supplier, selling seed, fertilizer, and pesticide obtained from market sources to the brokers, and this aspect contributes to the strength of the relationship between the parties.

In the branch at Nakhon Phanom investigated here, there is no watermelon production in the wet season since excessive rains can easily damage the crops, and there is also the substantial risk of flooding from the Songkram River. The brokers are in charge of contracting with farmers in their region. As is the case commonly in Thailand and indeed elsewhere in the world, contracts are not formal. The broker provides a "quota" to every farm household in terms of area to be planted, after consultation with the household, and carefully manages a planting and harvesting schedule for the farmers. Contractees noted that they usually did not have a problem in selling whatever they harvested to the broker even when yield expectations were exceeded. The price is not fixed beforehand, but rather depends upon supermarket terms, which in turn depends on market conditions at time of delivery. Supermarket size specifications and the chemical specifications for safe certification require a substantial quality control process, and the broker oversees such quality control. A constant stream of technical advice is provided by the broker, and at the end of each household's cycle the broker assists with the harvest and takes charge of the transportation.

The broker is also an input supplier to the contracted farmers. The seed, fertilizer, and pesticide sold by the proprietor to the broker are in turn sold on to the farmers. The broker often supplies these inputs on credit, recovering the amounts at harvest time. Thus, both at the proprietor level as well as the broker level, profit opportunities from watermelon buying from farmers are combined with interest opportunities from credit provision and profit from input supply to farmers. Although rural credit markets are fairly robust in Thailand in comparison with many other developing countries, there are transaction costs and access barriers associated with obtaining formal credit. In such a setting, the credit function of the broker–farmer relationship can be an important one.

Can small farmers benefit from such chains? The signals from the qualitative interviews are mixed. The participant farm households, who typically had been rice farmers before joining the scheme, seldom operate more than 2 or 3 hectares each. This appears to be the watermelon farm size that a typical farm household can efficiently control, given the highly labour intensive nature of the crop. However, interviews revealed that two forms of capital were important in joining the scheme: financial capital in the form of investment in land and machinery, and social capital in the form of recommendations from current participants or the broker. There is a cooperative element to the production process. Typically, blocks of land close to a reliable irrigation source are rented by a set of cooperating farmers. Although each household operates a separate enterprise, there is significant coordination in production, especially in terms of water control. Thus participating farmers are typically small scale, but entry into the scheme is difficult in the absence of financial and social capital. Some help may be available with raising the necessary finances, from informal or formal sources (BAAC), and so the social capital requirement is the most important constraint.

A key issue, raised previously, is the question of whether "leakage" from contract production into open markets undermines the contractual situation. The watermelon market in Thailand is certainly not as thin as in the case of many speciality vegetables and fruits. Thus there is the possibility of contractors opportunistically selling to other channels. However, safe vegetables are sold in Thai supermarkets at significant premiums compared to conventional watermelons sold on spot markets (Posri, Shankar, and Chadbunchachai 2007; Wiboonpongse and Sriboonchitta 2004). Spot markets do not offer a special price for safe produce. Given the higher cost of production once the opportunity cost of labour is accounted for, and the better prices typically received by the contracted farmers compared to conventional watermelon in the open market, contractees are unlikely to default and sell on the open market. Also, the broker at Nakhon Phanom forbids this strictly, with the threat of exclusion for farmers who are found to do so. The exception is for produce that does not meet the grade set by the supermarket and the broker. Contracted farmers are allowed to, and do regularly sell such below-grade leftovers on the open market, a practice that has been found to be common in contract farming examples from around the world. This helps minimize their risk. Thus an insight emerges, that the existence of parallel markets for high grade produce commanding a significant premium, and traditional spot markets involving all grades, can allow contractual situations to sustain, while also lowering the downside risk of farmers.

IV. Insights from Quantitative Data

Table 1 compares the basic demographic and farm characteristics of the sample of cooperative farmers and the sample of local traditional farmers. The similarities as well as differences are revealing. In terms of household size and the level of education of the household head, there is not much difference between the two groups. The farm size operated by the two groups has an identical median value of 3.2 hectares, which is somewhat lower than the national average of approximately 4. Clearly, there seems to be no size bias, small or large, to being in the cooperative. The two groups also operate

Table 1. Summary statistics and groupwise differences of basic demographic and farm characteristics

		CS Cooperative group			Local traditional farmers		
Variable	Units	Mean	Median	Std. dev.	Mean	Median	Std. dev.
Household size	persons	4.5	4.5	1.4	4.8	5	1.8
Age of head	years	41.3*	39	10.2	51.9*	48	13.1
Education of head	years	5.3	4	2.1	4.7	4	2.5
Farm size	hectares	3.1	3.2	1.6	3.5	3.2	2.3
Plots	number	2.2	2	1.5	1.9	2	0.9
Proportion rented	%	89.4*	100	28.9	0.5*	0	2.7
Livestock	tropical livestock units†	0.2*	0	1.15	4.3*	2.8	6.8

*Denotes group means significantly different at 5% level based on *t*-test.
†Tropical livestock unit weights: 0.7 for buffalo and cattle, 0.2 for pigs, 0.01 for ducks and chickens.

similar numbers of plots. However, it appears that cooperative members are younger on average than the local traditional farmers. The average age of the household head in the cooperative group is 41.3, which is more than 10 years younger than the average age of the local traditional farmers group. The group mean differences are statistically significant at the 5% level. Possibly, this age difference reflects the lower risk-aversion and enterprising nature of younger farmers.

The issue of how household characteristics influence participation in the contract scheme is further explored by means of a probit model explaining the probability of participation in the scheme as a function of household size and the age, education, and experience of the household head. (Results are presented in the appendix.) A larger household size is estimated to increase the probability of participation, possibly reflecting the labour-intensive nature of watermelon production. However, this effect is statistically insignificant. A lower age for the household head is seen to increase chances of participation, possibly reflecting differences in risk-aversion as discussed in the context of table 1, although the parameter is only significant at the 10% level. More farming experience similarly lowers the probability of participation. Somewhat surprisingly, higher education levels also lower participation probability, although this parameter is statistically insignificant.

Returning to table 1, the most striking difference between the two groups is in the proportion of land rented. Although farmland rental markets are reasonably efficient in Thailand, the norm for traditional farmers is to be owners rather than renters. This is reflected in the data, with the median traditional farmers not renting at all, and the mean rented proportion amounting to only half a percent. In stark contrast, the cooperative farmers seem to have completely moved away from land ownership, with the median farmer renting 100% of their land. These numbers, and information from qualitative interviews from the farmers, reveal that the nature of farming for the cooperative and the remuneration from it have resulted in cooperative farmers moving away from traditional agricultural land ownership. As noted before, farmers grow watermelon for the cooperative in the dry season. There are specific irrigation needs, and the farmers prefer to grow contiguously in blocks. Watermelon production exhausts the soil quickly, and after three years, the farmers have to rest the land they have been growing in and move

on to another site. These technical requirements favour land rental rather than ownership. Additionally, the remuneration from watermelon production is good enough to enable the farmers to move away from traditional rice production completely, becoming rice buyers. Of all the cooperative farmers in our sample, only one reported also growing rice. In the wet season, the cooperative farmers engaged in a variety of other off-farm and non-farm livelihood activities. Livestock ownership shown in table 1 is also indicative of how farmers growing for CS Cooperative have moved away from traditional farming. The tropical livestock unit (TLU) ownership for traditional farmers is 4.3 on average. Traditional farms in Thailand inevitably include some ownership of buffalo, cattle, and pigs and often dozens of chicken and ducks. However, farmers growing for the cooperative, retaining little agricultural land ownership in their native villages, and living and working intensively for 7 months of the year in rented land, have largely moved away from livestock ownership.

In summary, the comparison of demographic and farm characteristics reveals that participation in the supermarket chain does not appear to have a size or education bias. Participants and non-participant groups have similar makeups in terms of most demographic characteristics, with the exception that participants are younger on average. However, participation appears to have fundamentally altered the functioning of farm households. Technical requirements and remuneration from participation have caused them to become completely specialized in their crop, renters rather than owners of agricultural land, and buyers rather than producers of staples.

Table 2 shows the costs of production and gross margins per hectare[5] for watermelon and the local traditional competing crop, dry-season rice.[6] It is evident that watermelon is vastly more remunerative than rice production, providing a gross margin per hectare 13 times that of rice. This is consistent with comparisons made in other parts of the world between crops for high value chains versus local traditional crops. For example, von Braun, Hotchkiss, and Immink (1989) showed that contract farmers in Guatemala growing non-traditional export crops made 15 times the gross margin compared to other local farmers growing the traditional crop, maize. The costs and returns comparison show that watermelon is grown far more intensively than rice in terms of most variable inputs. Hired machinery and chemical inputs are particularly high for watermelon production compared to rice. In spite of the watermelons being grown by CS to a standard ensuring compliance with pesticide residue limits, more than 16,000 THB[7] are spent per hectare on average on pesticide input. The high fertilizer input costs for watermelon reflect the extent to which the crop depletes nutrients

5. Although desirable, family labour input data were not collected. An initial attempt was made, but recall of unpaid family labour input proved highly error-prone so the attempt was abandoned. Since cooperative cash-crop farmers are likely to use family labour more intensively than traditional rice farmers, the difference in margins reported are upper bounds of differences in profitability.

6. Several local traditional farmers also grew rubber. However, rubber is a multi-year tree crop, and therefore costs and returns information could not be collected in the cross-sectional survey. One or two local farmers also grew cash crops such as shallots and chilli, but on a very limited basis.

7. THB is the Thai baht. In 2005 when the data for the study were collected, the conversion rate was 33 THB to 1 $CA or 41 THB to 1 $US; 16,000 THB would have been equivalent to 484 $CA or 390 $US.

Table 2. Costs of production and gross margins for watermelon and rice (THB per hectare)

	Watermelon (coop farmers)	Rice (traditional farmers)
Total revenue	108,845	8097
Production costs		
Seed	5,667	1,729
Irrigation	391	76
Hired labour	6,592	1,850
Hired machinery	19,018	1,844
Land rent	7,681	0
Fertilizer	10,991	1,927
Pesticide	16,576	51
Fuel/other	7,043	451
Total costs	74,938	5,550
Gross margin per hectare	34,297	2,546

Note: All values calculated as sample mean values.

Table 3. Entry investments and loans of cooperative farmers

	Mean	Median	Standard deviation
Years in coop	4.6	5	2.1
Investment at entry (THB)	57,641	56,000	58,428
Loans taken (THB)	46,730	50,000	44,876

from the soil, and as noted earlier, watermelon-cropped land has to be returned to fallow after every three years of cropping in order to recover.

The fact that entry into the cooperative involves significant financial and social capital hurdles has been discussed earlier. Table 3 provides an idea of the financial implications of entering. Cooperative farmers had, on average, been growing for the cooperative for 5 years. At the time of entry, an investment of 56,000 THB was required on average, primarily in order to acquire machinery. Approximately 50,000 THB of this investment had to come from loans rather than existing farmer savings. This is doubtless an onerous financial burden for small-scale farmers. However, credit markets in Thailand function better than in most developing countries, and formal credit for contract farming has always been in reasonably good supply. The survey found that 68% of these loans had come from the BAAC, with most of the rest coming as loans from relatives. Thus the terms of the loans were typically not very detrimental to the entrants, and as indicated by the gross margin calculations, could typically be paid back from profits within one or two years.

The survey also elicited cooperative farmer respondent's ratings of the main benefits of growing for the supermarket supply chain and main perceived disadvantages and challenges. The responses are summarized in tables 4 and 5. From table 4, it is evident that respondents perceive the profits and the quantity purchase guarantee as the biggest positive aspects. Not a single respondent perceived these attributes as unimportant, with 96% rating them as either important or extremely important. Clearly, in spite of the supermarkets instituting weekly tendering processes and very short contracts and reserving the right to reject produce, demand is stable enough to keep growers satisfied.

Table 4. Cooperative farmers rating of advantages of growing for cooperative

	Attractive income (%)	Purchase guarantee (%)	Price guarantee (%)	Knowledge gained (%)	Credit (%)	Transport and marketing of produce (%)
Very unimportant	0	0	38	12	23	0
Unimportant	0	0	0	0	4	0
Neither important nor unimportant	4	4	42	8	31	8
Important	23	19	8	35	35	27
Very important	73	77	12	46	8	65

Table 5. Cooperative farmers rating of challenges of growing for cooperative

	Major problem (%)	A bit of a problem (%)	Not at all a problem (%)
Risk of crop failure	81	19	0
Heavy labour requirement	0	8	92
Low price	12	65	23
Heavy investment at start	46	42	12
Technological requirements difficult to follow	0	26	74
Technological requirements make production very costly	8	23	69
Lack of credit	15	15	70
Lack of inputs	15	19	66
Delay in payment	0	0	100
Very high quality standard: watermelon rejected often	12	31	57

Again, the coexistence of a supermarket-led higher-grade outlet, and an all-grade spot-market lends stability to the overall market while enabling good profit margins. The transport and marketing function performed by the cooperative is also seen as quite important by growers who would struggle to supply such a chain by themselves. Perhaps surprisingly, the credit function whereby the cooperative supplies inputs on credit, to be repaid at harvest, is not seen to be critically important. Only 8% of respondents rate it as extremely important, and 23% view it as completely unimportant. In other countries and contract farming settings, credit would probably be of great importance, but these ratings from Thailand are again testament to a well-functioning credit market.[8] Also, with the good returns afforded by contracting for watermelons, purchasing inputs on a cash rather than credit basis becomes easier after the initial years. This is consistent with information from Table 5, which shows that 70% of the respondents felt that lack of credit was not at all a problem. Two other ratings in this table are particularly

8. Siamwalla et al. (1990) provide an exposition of how competitive informal lending has complemented formal lending over the years in Thailand, resulting in a huge expansion in rural credit availability.

worthy of remark. Not a single respondent felt that delayed payment from the cooperative was a problem at all, which is testament to the stability and smooth functioning of this supermarket supply organization. The heaviness of labour input requirement was perceived as not at all a problem by the vast majority of the respondents. Although production is undoubtedly strongly labour intensive, the coordinated production in blocks, full involvement of household members in production, and a well-functioning hired labour market appear to make labour requirements not much of an issue. Quality standards do seem to present at least a bit of a problem to 43% of the respondents, but this does not emerge as a major issue.

Crop failure is the biggest challenge facing these producers, with 81% rating it as a major problem. As noted before, surplus production is usually not a risk, since the cooperative will buy all produce that meets quality standards, and below-grade produce can be sold on the open market. However, risks of production shortfalls are not shared in any way by other actors in the chain, and watermelon production remains somewhat risky.[9] While other markets appear to be functioning well in this setting, insurance markets for agricultural products are not strong, as is the case elsewhere in the world, and farmers have to bear the full brunt of crop failures. Given the high costs incurred in watermelon cultivation as seen in table 2, such failures can translate to substantial monetary losses. More risk averse farmers would not want to shoulder such risk by joining the cooperative. This is consistent with our speculation that cooperative members are on average significantly younger than those in the comparison group primarily due to risk aversion increasing with age. Cooperative farmers also presumably manage to share some of the risk by producing as a social group in contiguous blocks and relying on group-based social capital, but production risks are likely to be correlated in space, and hence risk exposure of members is still likely significant.

Conclusion

We conclude on a note of optimism: despite misgivings expressed by many authors (e.g., Boselie, Henson, and Weatherspoon 2003; Weatherspoon and Reardon 2003; Reardon et al. 2003), we find that small-scale farmers in our Thai case do indeed participate in and benefit from the supermarket chain, albeit not as direct contractees. Issues relating to labour supervision and intensity of family labour use, especially in MRL-compliant safe and organic production, encourage small-scale production. The majority of the cooperative farmers in our sample noted that they would like to increase their scale of operations, but "could not obtain increased quota" from the broker. The broker affirmed that she strictly limited quota on the basis of family size, preferring to add new households to obtain increased supply over the years. Note however, that

9. We cannot accurately measure production/yield risk in this study since only cross-sectional data are available. Nor are yield risk estimates for watermelon in Thailand available from published studies. Yield risk estimates for pumpkin, a vegetable whose production conditions are comparable to those for watermelon, are available from Sootsukon, Dechates, and Wu (2000) and indicate that yield risk is in the lower range among vegetables, although significantly higher than that for rice.

"small-scale farmers" does not translate to "poorest farmers." The financial and social capital investments required for entry imply that the poorest farmers would struggle to enter such chains, despite relatively generous formal credit availability.

In our case study, remuneration from contractual production is attractive enough for cooperative farmers to become completely specialized in their crop, moving away from traditional farming. This is not surprising in a country where food markets function well, so that cooperative farmers can become food buyers without a problem. Production risk remains the abiding problem, and a further barrier to the entry of the poorest strata of farmers. Notably, CS only guarantees a market for the produce of participants, and farmers are left to shoulder both production as well as price risk. This is different from many contract schemes in Thailand that offer a minimum price guarantee.[10]

However, the supply chain as a whole has sustained over the medium term, evidenced by the continued supply of watermelons by CS to the supermarkets over the years, and the fact that the median contract grower has been in the scheme for five years. One key factor promoting stability in this case is the coexistence of a higher grade, premium-bearing supermarket channel for safe lines, and a mixed-grade spot market channel.[11] This enables both the supplier at the higher end of the chain, as well as producers at the lower end of the chain, to cushion business risk. Output that cannot be sold into the supermarket channel can be disposed of in the spot market, even if only at lower prices. At the same time, the significant price premium commanded by safe produce ensures that supplies to the supermarket channel are prioritized and not diverted to the spot market thereby threatening the sustainability of the chain. Pesticide residue in produce is a major concern among urban Thai consumers these days, and the proliferation of safe lines marketed through modern retail is likely to continue generating such sustainable contract-farming opportunities.

Given the observed welfare-enhancement possibilities for participant small farmers and the sustainability of the chain as a whole, it is worth considering what the Thai government could do to foster more schemes linking smallholders to supermarket supply chains. As noted before, the Thai government has been a central figure in facilitating contract farming schemes in the past, and is well-positioned to play a similar "governing markets" role in supermarket chains. In doing so, the objective has to be to provide successful facilitation without imposing a heavy drain on the public purse as has sometimes proven to be the case in the past. Organizing multi-stakeholder platforms where interested smallholders, NGOs, research institutions, universities, brokers, and representatives of modern retail are brought together to explore market possibilities is an option. Overcoming the initial, significant hurdle involved in communicating market opportunities and associated technical needs to farmers and organizing and

10. We are grateful to an anonymous referee for pointing this out.

11. An example provided by Wiboonpongse et al. (2002) also suggests that the open market alternative may sometimes provide a safety valve that can help sustain contractual production. They discuss the example of a tomato production contract where farmers were prohibited from open market sales, and yet the contracting firm was under no obligation to buy any particular quantity. One season, when the tomato processing facility broke down, the harvested tomato had to rot, which led to contractees refusing to produce under contract from the next year onwards.

training them is the most significant challenge. Multi-stakeholder platforms may be an effective means to accomplish this. The Plataformas initiative in Ecuador (Cavatassi et al. 2009) is a successful example.

Appendix A

Probit Estimates of Farmer Participation in Contract Scheme

Variable	Coefficient	Standard error	P-value
Constant	3.81	1.67	0.02
Household size	0.22	0.20	0.25
Age of household head	−0.04	0.02	0.09
Education of head	−0.18	0.13	0.16
Experience of head	−0.17	0.04	0.0002

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