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Supply chain differentiation, contract agriculture, and farmers' marketing preferences: The case of sweet pepper in Thailand

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ABSTRACT

There is an emerging body of literature analyzing how smallholder farmers in developing countries can be linked to modern supply chains. However, most of the available studies concentrate on farm and farmer characteristics, failing to capture details of institutional arrangements between farmers and traders. Moreover, farmers' preferences have rarely been considered. Here, we address these gaps by analyzing different market channels for sweet pepper in Thailand. Using data from a survey and choice experiment with farmers, we find that there is a general preference for marketing options that do not involve a contract. Additional provision of inputs and credit can increase the attractiveness of contracts. Yet, the most important factor for farmers is to personally know the buyer they deal with, which may be related to issues of trust. Some policy implications are discussed.

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Introduction

The transformation of agri-food systems towards high-value supply chains implies a modernization of procurement systems in developing countries (Boselie et al., 2003; Reardon et al., 2003). Supermarkets in particular increasingly switch from buying through spot-market transactions to contractual agreements with farmers, often through specialized intermediaries (Balsevich et al., 2006; Berdegué et al., 2005; Neven et al., 2009; Rao and Qaim, 2011). There is an emerging body of literature analyzing how smallholders can be linked successfully to modern supply chains (e.g., Asfaw et al., 2009; Henson et al., 2005; Huang et al., 2007; Maertens and Swinnen, 2009). There are also numerous studies discussing the benefits and risks of contract agriculture (Glover, 1987; Gow and Swinnen, 2001; Mangala and Chengappa, 2008; Peterson et al., 2001; Simmons et al., 2005; Singh, 2002). However, both strands of literature hardly address details of concrete contractual arrangements between sellers and buyers in the context of emerging value chains and modernizing retail structures.

This is considered a drawback, because the design of contracts can crucially affect smallholder participation. For instance, contracts imposed by modern retailers often involve a number of requirements, like minimum quantities to be delivered or certain quality specifications, which are difficult to meet by smallholder farmers. Moreover, lack of credit or delayed payment in contract

schemes may deter small farms from participating. Depending on the availability of other marketing options, smallholders may also simply be reluctant to commit themselves to a certain buyer. Such aspects of personal preferences have hardly been considered in previous research. With few exceptions (Blandon et al., 2009; Guo et al., 2007; Masakure and Henson, 2005), available studies explain farmers' participation in modern supply chains through farm, household, and contextual characteristics, without explicitly accounting for subjective attitudes. This implicitly assumes that all farmers would sell in modern supply chains, if they were able to. In reality, this may not always be the case.

This article addresses these research gaps by analyzing trade relations between farmers and buyers in different marketing channels, using the example of sweet pepper in Thailand. Sweet pepper was introduced in Thailand some 10 years ago, mainly for exports and upscale domestic supermarkets. Over time, it gained wider popularity among domestic consumers, so that sweet pepper is nowadays also traded in more traditional wholesale and retail markets. Today, different contractual arrangements between farmers and traders can be observed.

Building on primary survey data, we analyze three main aspects. First, we describe trade relations of coexisting marketing channels and highlight differences between traditional and modern supply chains. Second, we examine farmers' subjective motivation to participate in particular marketing channels. And third, a choice experiment is used to analyze farmers' attitudes towards contracts and different hypothetical contract designs.

The rest of the article proceeds as follows. The next section gives some background information about the empirical database,

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the particular study region, and the existing marketing channels for sweet pepper in Thailand. Subsequently, different institutional arrangements between farmers and traders are compared, and reasons for farmers' marketing decisions are analyzed, before the choice experimental results are discussed. The last section concludes.

Data base and background

Data base

For our empirical study, we conducted a survey of 244 sweet pepper farmers in the Mae Sa watershed in Chiang Mai Province, northern Thailand. This watershed is where domestic sweet pepper cultivation had started in 1999, and it is still the main production area for sweet pepper in Thailand. The survey was conducted between May and July 2007. The Mae Sa watershed consists of 22 villages in total, but sweet pepper is cultivated in only 9 villages. In 2007, 252 farmers grew sweet pepper within these 9 villages. We tried to interview all of them, but four farmers were in the process of changing from sweet pepper to tomato cultivation, three were traveling outside the village during the survey period and therefore not available, and one farmer refused to answer the questionnaire. The 244 remaining sweet pepper farmers were interviewed by six trained enumerators from Chiang Mai University. Interviews were conducted in Thai, using a structured questionnaire especially designed for this research. Farm and farmer characteristics of the sample are displayed in Table 1.

Marketing channels for sweet pepper

Sweet pepper was introduced in Thailand in 1999 by a Dutch company. Because of climatic conditions, the northern upland areas were the primary target regions, especially those near the city of Chiang Mai, where infrastructure and market access conditions were relatively favorable. In particular, the company chose the Mae Sa watershed, where farmers were contracted to produce red and green sweet pepper in greenhouses, using hydroponics systems that make cultivation independent from soil quality

conditions (Schipmann and Qaim, 2010). Sweet pepper cultivation is labor and input intensive and associated with high capital investments, since sophisticated greenhouses are required. Since farms in the watershed are predominantly small-scale, with an average farm size of 1.6 acres, the company initially provided credit, private extension, and certain inputs to contracted farmers.

In 2007, three different marketing channels existed for farmers. The first consists of private agribusiness firms that deal with sweet pepper for export and for domestic supermarkets. Beyond the Dutch company, which had started the business in 1999, two additional firms have entered the market more recently. All three companies purchase sweet pepper from local farmers. The second marketing channel is the so-called Royal Project, which started to deal with sweet pepper in 2002. The Royal Project is a subsidized initiative by the King of Thailand to support disadvantaged farmers in the upland areas and offer alternatives to opium production, which was widespread in the 1970s and 1980s. The Project sells vegetables and other agricultural products in upscale retail outlets under its own brand name, which Thai consumers recognize as being of very high quality. However, only hill tribe farmers, who make up a relatively small part of the population in the Mae Sa watershed, officially have access to the Royal Project marketing channel. We consider these first two marketing options as modern retail channels. In contrast, the third channel involves traditional village traders, who also entered the sweet pepper market more

Table 2

Sweet pepper adoption and supply of different marketing channels (number of farmers), 1999–2007.

Year	Whole sample	Companies	Village traders	Royal Project
1999	4	4	0	0
2000	7	7	0	0
2001	17	14	3	0
2002	52	38	12	2
2003	76	50	22	4
2004	119	58	51	10
2005	152	48	92	12
2006	230	44	167	19
2007	244	45	178	21

Table 1

Characteristics of sweet pepper farmers, 2007.

Variables	Full sample (N = 244)	Non-contract farmers (N = 132)	Contract farmers (N = 112)
<i>Characteristics of the person responsible for farming decisions</i>			
Female (%)	45.9	50.8	40.2*
Age in years	42.2 (9.3)	42.4 (9.4)	42.1 (9.3)
Education in years of schooling	6.9 (3.3)	6.8 (3.4)	7.0 (3.2)
<i>Farm and household characteristics</i>			
Land owned (rai) ^a	3.9 (6.4)	3.5 (5.8)	4.3 (7.0)
Sweet pepper area (rai) ^a	1.3	1.5 (1.3)	1.1*** (0.8)
Land title ^b (%)	82.4	93.2	69.6***
Farming experience (years)	13.9 (9.4)	13.5 (9.0)	14.4 (9.9)
Sweet pepper experience (years)	2.7 (1.9)	2.8 (1.9)	2.6 (1.8)
Pick-up truck (%)	76.6	72.7	81.3
Off-farm occupation (%)	39.8	40.2	39.3
<i>Contextual characteristics</i>			
Member in a farm group (%)	82.0	78.8	85.7
Extension contact (%)	18.0	18.9	17.0
Good road conditions	78.3	85.6	69.6***
Medium road conditions (%)	12.3	9.1	16.1*
Bad road conditions (%)	9.4	5.3	14.3***

Notes: Mean values are shown. For continuous variables, standard deviations are shown in parentheses.

* Differences in mean value between contract and non-contract farmers are significant at the 10% level.

*** Differences in mean value between contract and non-contract farmers are significant at the 1% level.

^a One rai equals approximately 0.4 acres.

^b Land title is defined as having a land title for at least one of the plots under cultivation.

Table 3
Importance of contracts by marketing channel (in %), 2007.

Contracts	Whole sample (N = 244)	Village traders (N = 178)	Companies ^a (N = 45)	Royal Project ^b (N = 21)
Farmers without a contract	54.1	68.5	13.3 ^{***}	19.1 ^{***}
Farmers having an oral contract	30.7	27.0	28.9	66.7 ^{***}
Farmers having a written contract	15.2	4.5	57.8 ^{***}	14.3 [*]

^{*} Differences are significant at the 10% level.

^{***} Differences are significant at the 1% level.

^a Significance levels in this column refer to the difference between company and village trader suppliers.

^b Significance levels in this column refer to the difference between Royal Project and village trader suppliers.

Table 4
Aspects that are regulated in contracts by marketing channel (in %), 2007.

Aspect regulated	Whole sample (N = 112)	Village traders (N = 56)	Companies ^a (N = 39)	Royal Project ^b (N = 17)
Side selling	13	11	23	0
Pricing	47	63	28 ^{***}	41
Delivery	33	9	67 ^{***}	35 ^{***}
Grading	22	29	13 [*]	24
Production process	12	7	5	41 ^{***}
GAP	3	0	0	18 ^{***}

^{*} Differences are significant at the 10% level.

^{***} Differences are significant at the 1% level.

^a Significance levels in this column refer to the difference between contract company and contract village trader suppliers.

^b Significance levels in this column refer to the difference between contract Royal Project and contract village trader suppliers.

recently. They mostly supply traditional wholesale and retail markets in Chiang Mai and Bangkok.

Table 2 shows the development of these three marketing channels over time. This information was obtained through recall questions during the 2007 survey. In the first 2 years, all farmers sold their sweet pepper through the company channel. However, since 2005 traditional village traders have constituted the most important marketing channel, while the number of farmers supplying a company is steadily decreasing. The role of the Royal Project increased over time, but the overall market share remains relatively small. Managers of the three companies stated in interviews with us that they did not reduce the cooperation with local farmers from their side. Hence, the declining number of company channel suppliers appears to be driven mainly by farmer preferences to sell to village traders. Understanding such preferences is important to explain farmer participation in modern retail channels.

Supply chain differentiation and contractual arrangements

Contractual arrangements in different marketing channels

In a first step, we are interested in the importance of contractual arrangements in the different marketing channels. Table 3 shows that more than half of all sweet pepper farmers sell without any contractual arrangement. However, not all of these sales are spot-market transactions in a narrow sense, because farmers often have long-term informal relationships with their buyers without considering this as a binding arrangement. In those cases, concrete transactions are not agreed upon in advance, so that farmers remain flexible in their marketing decisions. Table 3 also confirms that contractual arrangements are significantly more often used in modern than in traditional supply chains.

We further differentiate between oral and written contracts. Oral contracts are observed more often, although the picture differs across marketing channels. Private companies in particular use significantly more written contracts. As they are run by non-locals, company agents are not integrated into the farmers' social networks; hence, they would not trust oral arrangements. This has also been reported in other contexts (Guo et al., 2007; Nagaraj et al., 2008).

Comparison of contract details

In the literature, it is often separated between production contracts and marketing contracts (Guo and Jolly, 2008; Singh, 2002; Wiboonpongse et al., 1998). Even though in our case all contractual arrangements comprise some features of both, marketing components dominate in contracts with traditional village traders and companies, whereas Royal Project contracts focus more directly also on production aspects.

Table 4 displays aspects that are regulated in contracts, differentiated by marketing channel. Most contracts refer to more than one aspect, so that the columns sum up to more than 100%. In contracts with village traders, pricing is by far the most important component; usually a minimum procurement price is specified. Another important component in village trader contracts is the specification of grading criteria. Given that high-value market segments for vegetables in Thailand are still emerging, uniform quality standards do not yet exist. In contrast, in company contracts the timing of delivery is the central feature, followed by pricing and agreements about side selling (i.e., whether or not sales to other buyers are allowed). Grading criteria play a smaller role; at least the biggest of the three companies uses a grading machine, so that special contractual specifications are not required. In the Royal Project channel, most contracts refer to pricing and details about the production process. The Royal Project is also the only marketing channel that requires a Good Agricultural Practice (GAP) certificate from some suppliers.¹

Another interesting aspect in some contracts relates to input delivery. As village traders sometimes also sell inputs to farmers that are not contracted, related details are not included in Table 4, but are shown separately in Table 5. The first two Table columns compare the situation of farmers with and without contract, whereas the other columns further differentiate between marketing channels. To facilitate comparisons and better highlight

¹ Farmers can get a GAP certificate when they produce according to the standard set up by the Thai Ministry of Agriculture and Cooperatives for each product. Products produced under the GAP certificate can be sold in retail markets under the so-called Q-label (Q standing for quality).

Table 5
Input delivery and payment mode for output sales (in %), 2007.

Inputs	Comparison between contracts		Comparison between contract farmers		
	No contract (N = 132)	Contract ^a (N = 112)	Village traders ^b (N = 56)	Companies ^c (N = 39)	Royal Project ^d (N = 17)
Input delivery	40	74 ^{***}	59 ^{**}	85 ^{***}	100 ^{***}
<i>Payment for output sales</i>					
At delivery	23	13 [*]	18	10	6
Within 1 week	25	30	27	41	18
Later than 1 week	52	56	55	49	77

^{*} Differences are significant at the 10% level.

^{**} Differences are significant at the 5% level.

^{***} Differences are significant at the 1% level.

^a Significance levels in this column refer to the difference between contract and non-contract farmers.

^b Significance levels in this column refer to the difference between village trader suppliers with and without contract.

^c Significance levels in this column refer to the difference between contract company and contract village trader suppliers.

^d Significance levels in this column refer to the difference between contract Royal Project and contract village trader suppliers.

Table 6
Timing and duration of contracts (in %), 2007.

Timing	All contract farmers (N = 112)	Village traders (N = 56)	Companies ^a (N = 39)	Royal Project ^b (N = 17)
Before production	71	54	87 ^{***}	94 ^{***}
Before harvest	29	46	13 ^{***}	6 ^{***}
<i>Duration</i>				
One season	92	89	100 ^{**}	82
Ongoing	8	11	0 ^{**}	18

^{**} Differences are significant at the 5% level.

^{***} Differences are significant at the 1% level.

^a Significance levels in this column refer to the difference between contract company and contract village trader suppliers.

^b Significance levels in this column refer to the difference between contract Royal Project and contract village trader suppliers.

differences in contractual details between channels, the group of “no contract” farmers only refers to those that sell to traditional village traders without a contract, whereas in the modern retail channels, we only consider the majority of farmers that sell under contract. The results show that the percentage of farmers who purchase inputs from the same trader that they also sell to is significantly higher among contract farmers. Under contract, inputs can be bought on credit, whereas non-contract farmers usually have to pay directly in cash. Hence, better access to inputs may be one reason for farmers to enter into contractual arrangements, which will be analyzed more explicitly further below. Overall, input delivery plays a bigger role in modern retail channels than in traditional supply chains.

The lower part of Table 5 provides details about payment modes for sweet pepper sales. Here, differences between the marketing channels are less pronounced. Even in the non-contract village trader channel, most farmers are paid later than 1 week after product delivery. In this connection, observations from different countries can vary widely. For instance, Guo et al. (2007) found that payment directly after delivery is the most common practice in contract farming in China, whereas Nagaraj et al. (2008) reported that contract vegetable farmers in India are often paid with a delay of 15 days or more.

Looking at the timing of contractual arrangements (Table 6), we find that most contracts are made before the production process starts. This holds true in all marketing channels, although the share of contracts that are only made before the harvest is bigger in traditional than in modern supply chains. This suggests that contracts with village traders provide somewhat greater flexibility for farmers. Yet, in terms of contract duration, Table 6 shows that almost all contracts are relatively short term in nature, mostly referring to only one production season. A similar result was reported by Guo and Jolly (2008).

Reasons for farmers' marketing decisions

After having described the existing marketing channels for sweet pepper and related institutional details, we now want to analyze farmers' motivations behind participating in particular channels. In the following, we first compare economic incentives before examining subjective reasons as stated by respondents in the interviews.

Economic incentives

The first and most obvious potential economic incentive for participating in a particular marketing channel is the expected or actual output price received. Table 7 shows how prices compare across marketing channels. Sweet pepper prices differ according to color and grade. There is green and red sweet pepper, and both colors are traded in the grades AB and C. Surprisingly, differences between contract and non-contract transactions are relatively small in many cases. Comparing the three contract marketing channels, the Royal Project always pays the best price, especially for the higher grade. Yet, these prices are partly subsidized, and, as mentioned above, participation in this channel is confined to certain minority groups. Companies pay a slightly higher price than village traders for green and a lower price for red sweet pepper, yet these differences are not statistically significant. This suggests that price differences may not be the main factor explaining farmers' marketing choices. Similar results were also found in other contexts (Hernández et al., 2007; Nagaraj et al., 2008), although there are also examples with more considerable price differences between traditional and modern supply chains (Balsevich et al., 2006; Mangala and Chengappa, 2008).

In order to analyze economic incentives more broadly, we compare costs, revenues, and gross margins of sweet pepper

Table 7
Average sweet pepper prices (in Thai Baht/kg), 2007.

Variety and grade	Non-contract farmers		Contract farmers	
	Village traders (N = 122)	Village traders ^a (N = 56)	Companies ^b (N = 39)	Royal Project ^c (N = 17)
Green, AB	33	31	33	41***
Green, C	21	19	20	21
Red, AB	43	49*	45	62*
Red, C	29	31	28	34

* Differences are significant at the 10% level.

*** Differences are significant at the 1% level.

^a Significance levels in this column refer to the difference between village trader suppliers with and without contract.

^b Significance levels in this column refer to the difference between contract company and contract village trader suppliers.

^c Significance levels in this column refer to the difference between contract Royal Project and contract village trader suppliers.

Table 8
Gross margin analysis (in Thai Baht/acre), 2007.

Particulars	Non-contract farmers		Contract farmers	
	Village traders (N = 122)	Village traders ^a (N = 56)	Companies ^b (N = 39)	Royal Project ^c (N = 17)
Yield (kg/acre)	6.29	8.03**	8.19	11.33**
Share of red sweet pepper in total (%)	52.13	43.22	79.70***	70.31**
Revenues	210,593	284,648***	323,255	576,292***
Input costs (chemicals and organic fertilizer)	55,440	70,280	77,582	85,917
Seed costs	18,731	21,875	31,355*	28,804
Labor costs	9842	7061	13,322	15,864
Total variable costs	84,013	99,216	122,259	130,585
Gross margin	126,580	185,431**	200,996	445,707***

* Differences are significant at the 10% level.

** Differences are significant at the 5% level.

*** Differences are significant at the 1% level.

^a Significance levels in this column refer to the difference between village trader suppliers with and without contract.

^b Significance levels in this column refer to the difference between contract company and contract village trader suppliers.

^c Significance levels in this column refer to the difference between contract Royal Project and contract village trader suppliers.

production across marketing channels in Table 8. Contract farmers tend to have higher yields than non-contract farmers, regardless of whether they participate in traditional or modern retail channels. This also leads to higher revenues and gross margins. These comparisons cannot explain if contract farming leads to changes in crop management practices that cause higher yields, or if relatively high yields are a precondition for participating in a contract market channel. While it is beyond the scope of this paper to analyze the direction of causality, the results still provide a hint that expected financial benefits may play a role for farmers to engage in contractual arrangements.

Comparing the three contract channels, it becomes obvious that participation in the Royal Project is particularly lucrative for those farmers who are eligible to this channel. Though not statistically significant, mean gross margins are also slightly higher in company channels than in village trader contract channels. This can mostly be explained by the greater importance of red-colored sweet pepper varieties that fetch higher prices than green ones. Hence, modern retail channels seem to offer a certain advantage over traditional markets. The fact that many farmers nevertheless drop out of the company channel may potentially be due to their inability to produce more red sweet pepper. Another possible reason may be that financial incentives are too small to compensate for perceived disadvantages associated with supplying companies, such as less flexible contracts. This will be further analyzed below.

Subjective reasons stated by farmers

Both the number and the share of farmers that supply sweet pepper through company channels have declined over time. As shown in Table 2, in 2007, 45 of the 244 sample farmers were supplying companies. Yet 109 farmers mentioned that they had supplied companies in the past; all 64 company dropouts have

switched to supplying village traders. Of the 178 village trader suppliers in 2007, 114 have always supplied sweet pepper to village traders. Among the Royal Project suppliers in our sample, none reported to have switched marketing channels since they started sweet pepper production. Table 9 summarizes the farmers' answers to a question about the most important perceived advantages of their own marketing channel in comparison with other alternatives. Only answers from those farmers who always supplied the same marketing channel are considered here.

There is a striking difference in stated advantages between non-contract and contract village trader suppliers. Whereas price is by far the most important perceived advantage for contract suppliers, non-contract farmers value their independence highest, closely followed by price, and the ability to discuss with the trader. Hence, losing degrees of freedom and the option to negotiate on the spot seem to be important reasons for some farmers not to engage in contracts. The statements about price advantages may appear somewhat contradictory; they reflect that farmers do not always have perfect price information. As discussed, actual differences in mean prices with and without contract are relatively small.

For modern retail channel suppliers, assured market access and input provision are the most important perceived advantages, suggesting that imperfections in input and output markets are generally felt as constraints. This may be due to seasonal market saturation in traditional channels and credit constraints, among other reasons. Similarly, Masakure and Henson (2005) found market uncertainty as a major reason for vegetable farmers in Zimbabwe to contract with an export company, while Minten et al. (2009) identified the option to obtain inputs on credit as an important factor among vegetable producers in Madagascar; in both these studies, higher incomes were only mentioned as a minor incentive to sign a contract.

Table 9
Farmers' perceived advantages of supplying a particular marketing channel (in %), 2007.

	Non-contract	Contract farmers		
	Village traders (N = 77)	Village traders (N = 37)	Companies (N = 39)	Royal Project (N = 17)
Independence	31	11		
Price	29	43	18	47
Ability to discuss	23	8		
Personal relation	17	14		
Transport	4	11		
Input provision		14	49	71
Knowledge transfer			23	52
Market access			52	53

Note: Farmers were allowed to mention more than one advantage. Only those who always supplied to the same marketing channel are considered.

Table 10
Farmers' stated reasons for changing marketing channels (in %), 2007.

	Initial reasons for company supply (N = 66)	Reasons for change (N = 66)	Advantages from supplying village traders with contract (N = 19)	Advantages from supplying village traders without contract (N = 47)
Input provision	41			
Market access	22			
Knowledge transfer	50			
Price		33	58	44
Independence		19	11	35
Ability to discuss			16	16
Personal relation			16	20
Intransparent grading		50		
Transport difficulty		8		

Note: Farmers were allowed to mention more than one reason/advantage. Only those who changed their marketing channel over time are considered.

Table 10 looks at statements by farmers who decided to change their marketing channel from supplying companies to supplying village traders either with or without contract. Knowledge transfer and input provision are the most important reasons why those farmers initially supplied a company. This makes sense, because companies had introduced sweet pepper in Thailand and were the only buyers of output and sellers of specific inputs during the first years. Now that related production technologies are more established, company contracts are no longer a precondition for growing sweet pepper. Accordingly, many farmers have switched permanently to supplying village traders. Indeed, most of the farmers who changed their marketing channel over time had started sweet pepper production in the early phase between 1999 and 2001.

When asked about concrete reasons for withdrawing from company channels, many farmers named strict and intransparent grading procedures (Table 10). Companies tend to grade in the absence of farmers. Moreover, at least one company uses a grading machine, so that farmers have no scope for discussion. These results support our earlier finding that there is limited trust between farmers and companies. Whereas written contracts can help to overcome some problems of trust from the companies' point of view, they hardly address farmers' concerns, at least not with the design used in this specific context. The second important reason stated for withdrawing is price, followed by the preference for independence. In a review of different studies, Sartorius and Kirsten (2007) also found that distrust, combined with a perceived loss of autonomy, is a major reason for contract failures between smallholder farmers and agribusiness companies.

Better prices are stated as the main advantage from supplying village traders with or without contract by those who switched

(third and fourth column of Table 10). As expected, non-contract village trader suppliers value independence higher than farmers who entered into a new contract. However, the fact that still 11% of the contract suppliers mention independence reflects that contracts with village traders are perceived less confining than those with companies.

Farmers' marketing preferences: a choice experiment

In order to analyze farmers' attitudes towards contracts and specific contract designs, a choice experiment was carried out with all 244 farmers as part of the farm survey.² Before conducting the choice experiment, it was carefully explained to farmers that all contract specifications used for this purpose were hypothetical ones, that is, they differed from existing contracts in terms of one or more attributes. The attributes and attribute levels used were carefully explained. Farmers were assured that their choice of a specific contract design or market channel in the experiment would not have any immediate consequence on their actual marketing activities. It was clarified that the results would be used more generally to identify how trade relations can be designed to be more attractive for farmers. In the following, we first describe the experimental design, before discussing the econometric approach and the estimation results.

Experimental design

The choice experiment method is theoretically based on Lancaster's model of consumer choice and econometrically on random

² Two farmers did not answer the questions in the choice experiment, so that they were excluded from this analysis.

Table 11
Marketing channel attributes and attribute levels used in the choice experiment.

Attribute	Attribute levels			
	1	2	3	4
Price in Thai Baht (kg)	Market price	+5	+15	+25
Input/credit provision	None	Seeds and chemicals	Seeds, chemicals, and additional credit	
Payment mode	Payment at delivery	25% of expected minimum payment is paid a month before harvest starts		
Relation to the buyer	Buyer is personally known	Buyer is known through other village traders	Buyer is not known at all	

utility models (Adamowicz et al., 1998). The underlying assumption is that demand is defined over the characteristics of goods, rather than over goods themselves. Therefore, choice experiments consist of different alternatives of a good, which contain various attributes with different attribute levels. That is, the respondent has to choose a certain combination of attribute levels, which characterize the good, rather than the good as such. It is assumed that the respondent chooses the combination, which gives the highest subjective level of utility. Choice experiments were initially applied in marketing and environmental economics, but recently they found broader application. In our case, we apply a choice experiment to identify farmers' preferences and attitudes towards different 'attributes' of a contractual arrangement.

Different experimental methods exist, such as contingent ranking, rating, and choice. Here we use the contingent choice approach, which is based on Louviere and Woodworth (1983); compared to the alternatives it builds on a somewhat more realistic setting, because farmers usually only select one out of several possible marketing channels.³ In the questionnaire and experimental design, we identified four contract attributes that we felt might be of importance for farmers and for which we found differences in the comparison of marketing channels. These are price, input provision, payment mode, and relation to the buyer.⁴ Price has four levels of valuation, payment mode has two, and the other two attributes have three levels each (see Table 11).

This set of attributes and levels implies a total of 72 ($4 \times 2 \times 3^2$) theoretically possible alternatives. By using an orthogonal design procedure (Louviere et al., 2000), a fraction of the complete factorial design was obtained, giving 16 alternatives to be presented to respondents. However, when testing the choice experiment, farmers assessed four of the alternatives to be unrealistic. For instance, a combination of the attribute levels 'not knowing the trader' with 'payment of 25% for a minimum quantity before harvest' was felt improbable. Following other studies (Gonzalez et al., 2009), we excluded four unrealistic alternatives; while this reduces statistical efficiency (Lancsar and Louviere, 2006) it increases the degree of market realism.

The remaining 12 alternatives were assigned to six choice sets, each comprising three alternatives: the first two were taken from the 12 orthogonally designed alternatives, and the third always displayed a combination of the lowest levels of all four attributes. In other words, the third option portrayed all the characteristics of the marketing situation of village trader suppliers without a contract, whereas the other two alternatives described a hypothetical marketing option under contract with different contract attributes. The two contract alternatives were purposely assigned to a choice set to ensure that none of the options is predominant and that

attribute levels differ as much as possible. Table A1 in the appendix shows the six choice sets and how often a respective alternative was chosen by farmers.

A choice experiment needs to be carefully planned and implemented as there are several factors that might lead to biased results, in particular to an overestimation of willingness to pay (for details see Carson and Hanemann, 2005). While some problems are more relevant when dealing with public goods, others also need to be considered in a private good situation like ours. The most important issue was to avoid receiving dishonest or unreliable answers either through the fatigue of respondents or through an inappropriate order of choice sets. To avoid fatigue, only four of the six choice sets were shown to each farmer. Regarding the order, choice sets were arranged in different sequences, and questionnaires were randomly assigned to farmers. This led to the following sample distribution of the choice sets: choice sets 1 and 2 were assessed by 163 farmers, choice sets 3 and 6 by 161 farmers, and choice sets 4 and 5 by 160 farmers, respectively.

Model specification

The choice data thus obtained were analyzed using a random parameters logit (RPL) model, also known as mixed logit (Hole, 2007). There are several advantages over standard logit models. RPL models assume preference heterogeneity among respondents, implying that they not only estimate the mean of a coefficient, but also the standard deviation of the coefficient's distribution around the mean. When this standard deviation is significant, preference heterogeneity for the respective variable exists. Moreover, unrestricted substitution patterns are allowed in RPL models, and correlation in unobserved factors is possible, which relaxes the assumption of independence of irrelevant alternatives (Campbell et al., 2006).⁵ In our model, we fix the price coefficient across the population, because we assume that all farmers have the same preference for higher prices. The other three attributes are random parameters, for which we assume a normal distribution in the sample (Layton and Brown, 2000).

We employ an alternative specific constant (ASC) for the third alternative, which is the non-contract village trader marketing channel. Thus, the estimated ASC coefficient reflects the general attitude of farmers towards marketing channels that do not involve contractual arrangements. A positive ASC coefficient would imply a general preference for non-contract alternatives.

³ In our sample of 244 farmers, only 8 had more than one marketing channel.

⁴ Additional contract attributes could have been interesting, but we decided to limit ourselves to four, in order to keep the experiment sufficiently simple and ensure that farmers base their choices on the combination of all attributes. While differentiation between oral and written contracts may appear relevant in general, this attribute would not have been independent from the relation to the buyer. In the local setting, written contracts are uncommon when farmers and buyers know each other personally.

⁵ The latter also holds true for nested logit models. However, the assumption of nested logit models is that the respondent takes decisions stepwise (Hensher et al., 2005), meaning in our context that in a first step the farmer decides between contract and non-contract marketing channels and in a second step for a certain alternative of these categories. Our data does not support such a general first-step decision for or against contracts. Each farmer was shown four choice sets, and almost half of all respondents (47%) chose both contract and non-contract alternatives in different choice sets. We therefore prefer the RPL model, which does not build on this assumption. The estimation results also indicate preference heterogeneity, which is another argument for the RPL model, because the nested logit does not account for preference heterogeneity.

Table 12
Random parameter logit models for farmers' market channel choice.

Attributes	Model (1)	Model (2)	Model (3)
<i>Mean parameter</i>			
Price	0.06*** (0.01)	0.06*** (0.01)	0.06*** (0.01)
ASC ^a	1.38*** (0.45)	2.72*** (0.65)	2.04*** (0.62)
Input provision ^b	1.04*** (0.27)	1.03*** (0.27)	0.99*** (0.26)
Input and credit provision ^b	1.30*** (0.40)	1.38*** (0.40)	1.31*** (0.39)
Payment in advance	0.19 (0.24)	0.18 (0.24)	0.08 (0.24)
Buyer known through others ^c	-2.34*** (0.41)	-2.72*** (0.44)	-2.62*** (0.50)
Buyer not known ^c	-3.31*** (0.40)	-3.43*** (0.41)	-3.68*** (0.54)
ASC × contract in 2007		-2.45*** (0.69)	
ASC × previous contract		-0.43 (0.80)	
ASC × land owned in rai			-0.11*** (0.04)
ASC × area cultivated with sweet pepper			0.50** (0.25)
ASC × off-farm occupation			-1.20** (0.54)
ASC × medium road conditions ^d			-0.80 (0.82)
ASC × bad road conditions ^d			-4.00*** (1.03)
<i>Standard deviation parameter</i>			
ASC	3.93*** (0.45)	3.90*** (0.48)	3.51*** (0.45)
Input provision	0.63* (0.34)	0.47 (0.33)	-0.17 (0.49)
Input and credit provision	-1.27** (0.59)	-1.00** (0.51)	0.84 (0.65)
Payment in advance	-0.18 (0.38)	-0.31 (0.44)	-0.30 (0.31)
Buyer known through others	0.97* (0.58)	-1.40*** (0.45)	1.28** (0.54)
Buyer not known	2.04*** (0.43)	-2.03*** (0.42)	-2.41*** (0.51)
Log likelihood	-653.76	-633.44	-628.04
Chi-squared	309.91***	287.95***	258.92***

Notes: The number of observations is $n = 3 * 4 * 242 = 2904$. Coefficient estimates from the RPL models are shown with standard errors in parentheses.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

^a ASC stands for alternative specific constant. As explained in the text, this refers to the non-contract trade relation alternative in our specification.

^b Reference category is no input provision.

^c Reference category is buyer is known personally.

^d Reference category is good road conditions.

In a first model specification, we assume that contract preference (or aversion) is uncorrelated with other farm and farmer characteristics. In simplified terms, this can be expressed as:

$$Y_{ijk} = \beta_0 + \beta_1 ASC + \beta_2 P_{ijk} + \beta_3 I_{ijk} + \beta_4 M_{ijk} + \beta_5 R_{ijk} + e_{ijk} \quad (1)$$

where Y is a binary variable, which takes a value of one if farmer i chooses a contract in alternative j and choice set k ; P , I , M , and R are the contract attributes price, input provision, payment mode, and relation to the buyer, respectively, and e is a random error term.

However, as contract preference may be correlated with socioeconomic characteristics, we specify additional models with interaction terms between ASC and other variables of interest. In model (2), we explore the influence of farmers' actual previous experience with different marketing channels as follows:

$$Y_{ijk} = \beta_0 + \beta_1 ASC + \beta_2 P_{ijk} + \beta_3 I_{ijk} + \beta_4 M_{ijk} + \beta_5 R_{ijk} + \gamma_1 (ASC \times C07_i) + \gamma_2 (ASC \times C_i) + e_{ijk} \quad (2)$$

where $C07$ is a dummy that takes a value of one if farmer i was actually producing under contract at the time of the interviews in 2007, and C is a dummy that takes a value of one if the farmer produced under contract previously but had stopped to do so at some point. Thus, these interaction terms help to identify whether actual contract experience influences general contract preferences.

In a third model, we test the influence of other socioeconomic variables by including interactions with the ASC as follows:

$$Y_{ijk} = \beta_0 + \beta_1 ASC + \beta_2 P_{ijk} + \beta_3 I_{ijk} + \beta_4 M_{ijk} + \beta_5 R_{ijk} + \delta' (ASC \times F_i) + e_{ijk} \quad (3)$$

where F is a vector of farm and farmer characteristics. Initially, we included all farm and farmer characteristics displayed in Table 1, but then excluded those interaction terms that proved to be individually and jointly insignificant.

Estimation results

The estimation results of the three RPL models are reported in Table 12. Coefficient means as well as standard deviations for the random parameters are shown. At first, we concentrate on model (1). With the exception of payment mode, all coefficient means are statistically significant at the 1% level. Results for the standard deviations in the lower part of Table 12 show that preference heterogeneity exists for all attributes, except for payment mode. This confirms the structural advantage of employing the RPL specification.

According to expectations, the coefficient of price is positive, indicating that contracts with higher prices increase farmers' utility and the probability of choosing a contract marketing channel. Likewise, input provision, especially when combined with additional credit provision, is an incentive for farmers to engage in contracts, confirming some of our earlier findings. Personally knowing the buyer also seems to be an important aspect for farmers, as indicated by the negative and significant coefficients of the "buyer known through others" and "buyer not known" variables. In other words, the less a farmer knows the contract agent, the less likely he/she is to choose a contract channel.

The positive coefficient for the ASC shows that farmers generally prefer a marketing channel that does not involve a contract. Yet, preference heterogeneity exists for this variable, so that not all farmers necessarily share the same negative attitude towards contractual arrangements. Table 12 also shows the results of our second model, which includes the two ASC-contract experience interaction terms as described above. The ASC coefficient itself is larger than in the first model, indicating that those without own contract experience have even more negative attitudes towards contracts in general. The coefficient of the first interaction term

is negative and significant, indicating that the negative attitude is reduced among those that actually produced under contract in 2007. Given that farmers choose their marketing channel themselves, this is plausible. The coefficient of the second interaction term is not significant, implying that the hypothesis of equal general attitudes between those who stopped producing under contract and those who never had a contract cannot be rejected.

Model (3) in Table 12 shows that other socioeconomic variables also influence the general attitude towards contracts. Several of the interaction terms between the ASC and farm and farmer characteristics turned out to be significant. Interesting to observe is that the interaction with land owned has a negative coefficient, while the interaction with area under sweet pepper has a positive coefficient. Obviously, larger farmers are less averse to contracts, unless they specialize on sweet pepper. This makes sense, because not selling through a contract involves higher search costs to identify the appropriate marketing channel for sweet pepper. Larger farmers who primarily focus on other enterprises may have a higher opportunity cost of time, so that they are somewhat more willing to opt for the time-saving contract alternative. However, the magnitude of the coefficient is relatively small (-0.11), so that a general contract aversion remains, even among the larger farmers.⁶ For more specialized sweet pepper producers, this contract aversion is bigger than that of the average producer. They are willing and able to spend more time on sweet pepper marketing. In addition, when sweet pepper is their main farming activity, their perceived loss of flexibility and autonomy may be bigger when entering into a contract.

The estimation results further show that farmers with an off-farm occupation are less contract-averse than full-time farmers, which is probably also related to their higher opportunity cost of time. Finally, the interaction term between the ASC and bad road conditions is negative, which seems reasonable. Farmers in villages with bad road conditions face higher transport costs and generally have fewer marketing alternatives, so that they are much more willing to enter into a contract, when the opportunity arises. The negative coefficient estimate of this interaction term is bigger in absolute terms than the ASC coefficient itself, indicating that farmers in villages with bad road conditions even have a clear preference for selling under contract.

In summary, with few exceptions, Thai sweet pepper farmers prefer a non-contract marketing channel. In terms of contract design, they favor arrangements involving higher specified prices and provision of inputs and credit. Moreover, they prefer contracts with traders or agents that they know personally. Our findings point in the same direction as those by Blandon et al. (2009), who analyzed marketing preferences of fruit and vegetable producers in Honduras, yet without explicitly looking at issues of contract design. Overall, these results confirm that – in addition to the usual constraints that smallholders face – their marketing preferences matter for the question whether or not they participate in modern supply chains.

Willingness to accept analysis

The estimated parameters from the RPL model can also be used to calculate the willingness to pay (WTP) for each single attribute, which further helps to understand respondents' incentive structures and quantify their preference levels. In consumer choice studies, WTP is used, as these studies usually explore how much a consumer is willing to pay for a certain attribute level that is included in a good they are asked to buy. In our case, however, farm-

ers sell a good, so that the original question changes to what price a farmer is willing to accept (WTA), when a certain attribute level of a contract changes. WTA measures can be derived for each attribute level by dividing the coefficient of the attribute by the price coefficient and multiplying by -1 (Colombo et al., 2005).

We use the results from model (1) for these calculations, as we are interested in the mean values. The highest WTA can be observed for the attribute levels referring to the relationship with the buyer. A farmer would require a sweet pepper price that is 55.20 Baht/kg higher to enter a contract with a buyer whom he/she does not know personally or through others. This is an increase of 127% compared to the average price for red sweet pepper paid by a village trader to non-contract farmers. The marginal WTA for entering a contract with a buyer that is not known personally but through others is 39.00 Baht/kg, still implying an increase of 90%. The WTA for the other significant variables is negative. When chemicals and seeds are provided as part of the contract, farmers would accept a price that is 17.33 Baht/kg (40%) lower than if no inputs are provided (this is net of the actual input cost). When inputs and additional credit are provided, the marginal WTA is -22.60 Baht/kg, implying a price decrease of 52%. Considering the ASC coefficient, we also find a negative WTA. A farmer would accept a price that is 23.00 Baht/kg (53%) lower when a marketing channel does not imply a contract of any form.

The exact WTA values should be interpreted with some caution, and their magnitude might have to be discounted somewhat, given the well-known hypothetical bias that stated preferences data often suffer from. However, there is no reason to believe that the hypothetical bias is stronger for some attributes than for others, so that a relative ranking can still be made. In this respect, it is particularly interesting to observe that for farmers the positive utility associated with knowing the buyer seems to outweigh the negative utility associated with entering a contract in general. This suggests that missing personal links between companies and farmers are more important than the fact that there are contracts as such for explaining farmers' withdrawal from the company marketing channel. This is probably related to issues of trust and is an important result for improving contractual relationships in high-value markets.

Conclusions

We have analyzed the marketing behavior of sweet pepper farmers in Thailand in the light of ongoing market differentiation. In particular, we examined the role and details of contractual arrangements to better understand farmers' market channel choices. Sweet pepper was introduced in Thailand some 10 years ago, mainly meant for exports and upscale domestic supermarkets. Initially, specialized companies were the only available marketing channel, purchasing sweet pepper from farmers via contractual arrangements. More recently, the Royal Project, which also caters for modern retail outlets, and traditional village traders entered the market. Whereas the Royal Project also mostly works with contracts, many village traders purchase sweet pepper from farmers without a contractual arrangement. Over time, village traders became the most important marketing channel for sweet pepper; many farmers who had previously sold to companies switched to supplying village traders.

Our descriptive comparison of marketing channels and contract features confirms that significant differences exist, which influence farmers' choices. While output prices matter, farmers also value other aspects such as access to inputs, credit, and information, as well as independence and flexibility. Contract marketing channels are associated with higher net incomes. Strikingly, however, gross

⁶ As was shown in Table 1, the average farm size in the sample is about 4 rai.

margin differences between company and village trader contract suppliers are relatively small and not statistically significant.

A choice experiment was used to analyze farmers' attitudes towards contracts and related details more directly. The results reveal that farmers generally prefer non-contract marketing options. Yet there are certain factors that influence this general attitude. In terms of farm and farmer characteristics, higher opportunity costs of time and fewer marketing alternatives as a result of bad infrastructure conditions increase the attractiveness of entering into a contractual arrangement. In terms of contract design, contracts that also involve the provision of inputs and credit are clearly preferred. Remarkably, the most important factor is the relationship between farmers and buyers. The positive utility associated with knowing the buyer personally seems to outweigh the negative utility associated with entering into a contract in general, which is probably related to issues of trust.

In many developing countries, the role of modern supply chains involving contractual agreements between farmers and agribusiness firms or their agents is growing. Hence, the question of how smallholder farmers can be linked successfully to these emerging markets is of high policy relevance. Much recent work has analyzed factors that might potentially hinder smallholder participation, mostly focusing on transaction costs and financial and technical constraints. Our results suggest that concentrating on such constraints alone may result in an incomplete picture, because farmers' marketing preferences also matter. This should be considered more explicitly in future research.

For sweet pepper in Thailand, companies have started to establish own integrated production plants in peri-urban areas, partly because they find it difficult to source sufficient produce from smallholder farmers. Similar trends can also be observed for other high-value products and in other countries. Sometimes, integrated production by agribusiness companies can generate new employment opportunities for rural households, as was found by [Maertens and Swinnen \(2009\)](#) in Senegal. But this cannot always be expected; in Thailand, for instance, integrated sweet pepper production is very technology-intensive, with little use of unskilled manual labor. Hence, not integrating small farms into modern supply chains more successfully can be associated with lost opportunities for rural development.

Beyond addressing widespread market imperfections, which is certainly important, our results suggest that improving the relationship between farmers and buyers could also contribute to more widespread smallholder participation in contractual arrangements. Against this background, the fact that company representatives and intermediaries are often non-locals is not conducive. One approach could be to more explicitly involve local traders, who have established long-term relationships with farmers. Where this is not possible logistically, companies and intermediaries could try to improve ties with farmers through other trust-building mechanisms, such as more frequent personal interactions and more transparent pricing and grading procedures.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.foodpol.2011.07.004](https://doi.org/10.1016/j.foodpol.2011.07.004).

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