COMPARATIVE ANALYSIS OF NON-CONTRACT AND CONTRACT FARMERS IN TEA SECTOR IN VIETNAM: THE CASE STUDY IN THAI NGUYEN AND PHU THO PROVINCES

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SUMMARY

Contract farming is seen as the way of linking agribussiness and farmers by delivering, market information and risk sharing to smallholders. This study was conducted to examine the roles of contract farming in tea sector in Thai Nguyen and Phu Tho provinces which are two of the largest tea producers of Vietnam regarding both production and farming area. The data used in this study was based on the survey of 47 tea farmers and 5 processing firms in 2013. The frontier model is applied to investigate whether contract farms more technically efficient than non-contract farms The findings of the study rejected the hypothesis that contract farming is an effective tool to increase farmer's income. Moreover, the frontier empirical analysis reveals that some input variables have positive impacts on the output of tea production. Finally, the stochastic frontier indicates that there is no statistically significant different in terms of technical coefficients for both contract and non-contract farmers.

Keywords: *Contract farming, Cobb-Douglas production function, efficiency, non-contract farming, tea sector, Vietnam*

INTRODUCTION

The role of contract farming in developing countries has been a controversial issues since the 1970s (Glove 1984; Minot 1984) [5,10]. The recent studies provide various evidences to support the advantages, though contract farming system, to small farmers in developing countries (Glover and Kusterer 1990; Simmons 2002; Nguyen et al 2005; Myata et al.2007 [6,16,13,11] For example, Glover et al. (1990) [6] stated that contracting is fundamentally way of sharing risk between firms and growers; Whereas Patrick (2004) [14] considered contract farming as an intermediate production and marking system that spread the risk between agribussiness and smallholders. Otherwise, there is evidence proving that farmer can value their independence. For instance, benefits to growers from contracting, such as risk reduction, may be overestimated if the benefits enjoyed by independent producers are not accounted for (Key, 2005) [7].

Tea production plays an important role in household's income proportion in rural areas of Vietnam, especially in Thai Nguyen and Phu Tho. Vietnam produces three main types of processed tea: 60 percent black tea, 7 percent CTC black tea and 3 percent green tea (Accenture, 2000) [1]. Vietnam has five major tea production regions, including Northwest (Son La, Lai Chau), Northeast (Tuyen Quang, Ha Giang, Lao Cai and Yen Bai), Northern midlands (Vinh Phuc, Phu Tho, Bac Giang, Bac Kan, Thai Nguyen), North central (Thanh Hoa, Nghe An, Ha Tinh) and centrak highlands (Lam Dong, Gia Lai, Kon Tum) (Tran et al 2005) [13]. In Vietnam, contract farming has been implemented for many products such as livestock, fruit and vegetables, sugarcane, cassava, tea etc There are many cases in which a contract is mutually beneficial (Dang et al. 2005, Pham et al. 2004) [3,15]. However, there has been little research of the cost and benefits to tea producers of entering contracts That is why the study was conducted to look at the contract farming in the tea sector and make a comparative analysis between the contract farming and non-contract farming.

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RESEARCH METHODOLOGY

Data collection and study site

The fieldwork was undertaken in Thai nguyen and Phu Tho province where tea production is about 30% of Vietnam's total tea production, and tea farming land is 25% (Tran et al. 2005) [13]. A multistage sampling technique was adopted in selecting 47 farmers in 9 districts in study area. The farm-level data was collected by interviewing farmers based on detail questionnaires, including information about general characteristics of household, farm size, inputs and output. Officials of all five processing firms were also interviewed. Secondary data was collected from vietnam agricultural census, relevant reports etc.

Data analysis method

The modeling and estimation of production efficiency of tea farm is an important part of this study. Previous studies have applied various econometric models to analyse the benefits and risk of contracting such as Probit model, Logit model, Regression model and Cobb-Douglas production function (Dileep et al. 2002; Leung et al 2008) [4,12]. Hence, the study bases on series of work by Cobb-Douglas production function which has the form as following:

$$Y = AK^{\alpha}L^{\beta}V^{\gamma} \quad (1)$$

Where Y indicates the output level, K is capital input; L is labor input, V is other input, and A, α, β, γ are parameters determining the production technology. Taking logarithm both sides of function, we obtain:

$$\text{Log } Y = \text{Log } A + \alpha \log K + \beta \log L + \gamma \log V + \varepsilon \quad (2)$$

The frontier model is used to measure the production efficiency of farms which is adapted from Aigner et al. (1977) and Meeusen and Van de Broeck (1977) [1,9]. The stohastic frontier production is defined by:

$$Y_i = f(X_\alpha,\beta)\exp(v_i - \mu_i)\} \quad i = 1, 2, \ldots N \quad (3)$$

Where Y is a quantity of output, X_α is a vector of inputs; β is a vector of parameters and v_i is a random error having zero mean which is associated with random factors μ_i is a non-negative random variable which is inefficiency associated with a number of technical factors in produciton. The random errors (μ_i = 1, 2, . N) are assumed to be independently and identically distributed as N ~ $(0, \sigma^2)$ random variable of the μ_is which are assumed to be non-negative truncation of the N ~$(0, \sigma^2)$ distribution. The technical efficiency of the firm in the context of the stochastic frontier production function (4) namely:

$$TE = \exp(-\mu_i) \quad (4)$$

For the empirical analysis, a Cobb-Douglas stochastic frontier production function is assumed to specify the technology of tea producing farmers. The model is defined by:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + v - \mu \quad (5)$$

where Y is the total output (kg); X_1 is human labor (man-days); X_2 is fertilizers (1000 vnd); X_3 is pesticide (litters); X_4 is tea land (ha); v is assumed to be random errors; μ is non-negative random variables associated with technical inefficiency of production.

RESULTS AND DISCUSSION

Descriptive summary of annual production cost

Table 01 summarizes the difference of an annual production cost between contract and non-contract farmers. For contract and non-contract farmers, fertilizer, pesticide and labor costs are the highest material expenses. Moreover, analyzing tea efficiency shows that production cost of contract farmers are relatively higher than no-contract ones. Similarly, contract farmers also have significantly higher irrigation costs than non-contract farmers, 106.3 vnd/kg compared with 35.1 vnd/kg. This might be explained that farmers under contract have to follow the cultivation guidelines of contractors to meet their requirements of tea quality and quantity. Nevertheless, contract farmers pay less interest to payment than non-contract farmers because they can borrow credit from contractors while non-contract farmers have to borrow from private lenders or banks with higher interest rates.

Table 01: *Variable summary used in Frontier model*

Items	Contract farmers		Non-contract farmers	
	VNĐ	Percent (%)	VNĐ	Percent (%)
Chemical fertilizers	1018.1	40.8	843.1	39
Organic fertilizers	112.9	4.5	41.8	1.9
Pesticide	469.5	18.8	445.6	20.6
Herbicide	22.4	0.9	56.8	2.6
Electricity and fuels	103.6	4.2	35.1	1.6
Fixed assest deterioration	22.6	0.9	11.4	0.5
Garden deterioration	63.9	2.6	49.1	2.3
Tools	35.9	1.4	34.8	1.6
Insurance	1.7	0.1	0	0
Agricultural tax	10.8	0.4	20.8	1
Land rent	0	0	0	0
Interest payment	13.2	0.5	39	1.8
Hired labor	532.1	21.3	532.2	24.6
Family labor	84.6	3.4	52.2	2.4
Other costs	2.4	0.1	2.5	0.1
Total	**2493.9**	**100**	**2164.5**	**100**

Source: Author's surveyed data in 2013

Motivation factors and benefits to participate in contract farming

The literature highlight that the use of contracts is increasing common across a range of agricultural commodities in both industrialized and developing countries. This study has been implemented to investigate the difference motivation factors effect to participate in contract farming in tea production in both Thai Nguyen and Phu Tho provinces. The finding of the study indicates 8 factors motivating farmers to contract for tea production illustrated in Figures 1 and 2. From the perspective of the tea farmers, the motivation is varied from information asymmetry, the need to access credit to overcome input supply problems, the need to potential enhancements in access market and extension technology. It may also differ in term of farmers' response to production and price risk.

As can be seen from figure 1, the most important motivations of Thai Nguyen's tea farmers are the gaining a reliable access to credits, accessing market, and accessing to extension technology (100% agree). However, a range of other factors are also important motivations, in particular the fact that there is a reduction in risk (80% agree), a reduction in production cost (60% agree), and a reduction in labour cost (40% agree). Acquisition of information to apply cultivation skills that provided by contractors is also an important movitating factors (40% agree). Whereas, all farmers responded that social insurance is not an important motivation in making decision of signing contract. In addition, more than 50% farmers disagree with a reduction labour cost motivation as well as production cost (about 40% disagree). The reason is that they have to follow the steps in production process to meet the requirements of contractors, so they have to pay more attention and require more credit to do so.

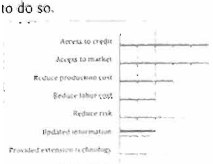

Figure 1: *The motivations effects to participate in contract of Thai Nguyen's tea farmers*

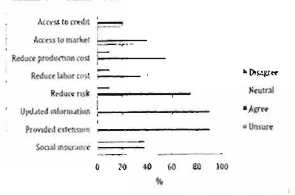

Figure 2: *The motivations effects to participate in contract of Phu Tho's tea farmers*

Analyzing factors in Phu Tho province shows the similar broad motivations for contracting as in Figure 2. However, these motivations are ranked differently. The results show that the most important motivation is the provision of technology and information with about 90% agreement. The next factor is the sharing of risk to contractor with about 70%. Conversely with contract farmer in Thai Nguyen, a large propotion of farmers in Phu Tho has neutral attitude toward the motivations of contracting. Overall, these results suggest that the decision to sign a contract with tea processing companies is motivated by a number of factors simultaneously.

Beside the study also analyzes benefits that farmers receive for signing contracts. The results are presented in Figure 3 below. A large proportion of farmers responded that they received cultivation technologies, new varieties, credit and fertilizers from contracting (more than 50%). However, a large number of farmers confirmed that contractors do not support any new enterprise and varieties. This could lead to the fact that contract farmers have .o invest their own money in inputs use for tea production. Otherwise, about 50 percent of respondents said that they received the support for land and labour. Overall, the study results indicate that most farmers satisfy with contracting because they received many benefits from contracting as expected.

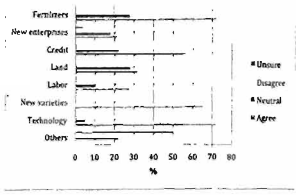

Figure 3. *The benefits of tea farmers from contract*

Estimation of stochastic frontier production function

Analyzing input-use efficiency shows that land, labor, fertilizer and pesticide have positive effects on tea output; In which land and labor are main factors to determine level of output. Land coefficient of 0.47 means that tea output will increase by 0.47% when tea area increases by 1%. The sum of technical coefficients ($\Sigma\beta_i$ = 1.09) is greater than 1. This means tea farmers employ an increasing return to scale. The statistical testing result has also proved the statement. Table 02 reports that "sigma_μ = 0, chibar2 (01) = 0.00 Prob>= chibar2 = 1.000" means that there is no technical inefficiency components in the model.

With purpose of seeing difference of input-use efficiency between contract farmers and independent farmers as well as finding variables to explain technical inefficiency, another Frontier production model was estimated with additional factors related to household head such as gender, ethnic, education, household type. The result in Table 03 indicates small changes in technical coefficient; In which land and labor coefficients increase slighly. The z values of coefficients in technical inefficiency variation are very small, showing that there is no technical inefficiency in the model. And technical coefficients for contract farmers and non-contract farmers are not statistically significant different.

Table 02: *Estimated parameters of stochastic frontier production function*

Lnoutput	Coef.	Std.Err	z	p>|z|
Lnarea	0.47	0.03	15.85	0
Lnlaborcost	0.28	0.02	11.43	0
Lnchemfer	0.16	0.03	6.02	0
Lnpestcost	0.19	0.02	8 13	0
_cons	-0.50	0.28	-1.78	0.075
/lnsig2v	-4.41	0.15	-29.88	0
/lnsig2u	-11.44	131.56	-0.09	0.931
Sigma_v	0 11	0.01		
Sigma_u	0.00	0 22		
Sigma2	0.01	0.00		
Lambda	0.03	0 22		

Log likelihood = 78 772379; wald chi2 (4) = 2144 15; Prob > chi2 = 0.0000
Likelihood-ratio test of sigma_u = 0: chibar2 (01) = 0 00; Prob>=chibar2 = 1.000

Table 03. *Production Frontier Model Results*

Variables	Coefficient	Std.err	P>|z|
Lnoutput			
Lnarea	0.49	0.03	0
Lnlaborcost	0.31	0.02	0
Lnpestcost	0.16	0.02	0
Lnchemfer	0.15	0 03	0
_cons	-0.64	0 22	0.004
Lnsig2v			
_cons	-4.84	0 26	0
Lnsig2u			
Gender	-5.29	9.47	0.576
Ethnic	-0.26	0.63	0.675
Education	-0.20	0.56	0.725
Hhtype	1.49	1.35	0.272
_cons	-0.89	8.59	0.918
Sigma_v	0 09	0.01	

Log likelihood = 87.955082; Wald chi2(4) = 1965 96, Prob > chi2 = 0 000
Source: Calculation from surveyed data in 2013

CONCLUSION

The rapid expansion of contract farming in Vietnam needs the empirical varification of its impacts on farmers This is why the study aims to estimate average impacts of contract farming on tea farmers. As contract farmer may be different from non-contract farmers in several ways and the decision of joining contract is also varied. This study used frontier production model to analyze the input-use efficiency of both contract and non-contract farmers in Thai Nguyen and Phu Tho provinces. The study also investigated the different factors that have important impacts on farmers's behavior toward contracting

The study result revealed that there is not statistically significant different in terms of technical coefficients for both contract and non-contract farmers In other words, contracting scheme has not strongly benefited on tea farmer's income Moreover, the findings of the Frontier empirical analysis shows that land, labor, fertilizer and pesticide have positive effects on tea output And the sum of technical coefficients ($\Sigma\beta_i$ = 1 09) is greater than 1. This means tea farmers employ an increasing return to scale Lastly, analyzing motivation factors to participate in contract indicated that decision to sign a contract with tea processing companies is motivated by a number of factors

simultaneously. While these motivation factors varied highly from Phu Tho to Thai Nguyen province. It has been shown that these factors vary according to the prevailing situation of producers.

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TÓM TẮT
SO SÁNH HIỆU QUẢ SẢN XUẤT GIỮA HỘ THAM GIA KÍ HỢP ĐỒNG VÀ HỘ KHÔNG THAM GIA HỢP ĐỒNG NÔNG SẢN: TRƯỜNG HỢP NGHIÊN CỨU HỘ SẢN XUẤT CHÈ TẠI THÁI NGUYÊN VÀ PHÚ THỌ

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Hợp đồng nông sản được xem như là một biện pháp nhằm liên kết giữa doanh nghiệp và nông dân nhằm cung cấp thông tin và đưa sản phẩm ra thị trường cũng như chia sẻ rủi ro trong sản xuất cho nông dân. Nghiên cứu này được thực hiện nhằm đánh giá vai trò của việc kí kết hợp đồng trong ngành chè ở Thái Nguyên và Phú Thọ, là hai tỉnh có diện tích và sản lượng chè hàng đầu Việt Nam. Dữ liệu được sử dụng trong nghiên cứu này được thu thập thông qua khảo sát 47 hộ trồng chè và 5 nhà máy chế biến năm 2013. Mô hình đường biên được ứng dụng nhằm so sánh mức độ hiệu quả kỹ thuật giữa nông hộ ký hợp đồng sản xuất chè và nông dân không tham gia kí hợp đồng. Kết quả nghiên cứu cho thấy hợp đồng sản xuất chè không phải là công cụ hiệu quả để nâng cao thu nhập của nông dân trồng chè trên địa bàn nghiên cứu. Thêm vào đó, kết quả phân tích mô hình đường biên thực tế cho thấy các nhân tố đầu vào có ảnh hưởng tích cực đến sản lượng chè đầu ra như đất đai, lao động, phân bón, thuốc bảo vệ thực vật. Kết quả nghiên cứu cũng chỉ ra rằng không có sự khác biệt ý nghĩa về hệ số hiệu quả kỹ thuật giữa hộ tham gia hợp đồng sản xuất và hộ không tham gia hợp đồng.

Từ khóa: *Hợp đồng sản xuất, hàm sản xuất Cobb-Douglas, hiệu quả, ngành chè, Việt Nam*

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