Determinants of Fresh Fruits and Vegetables (FFV) Farmers' Participation in Contract Farming in Peninsular Malaysia

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Abstract

The purpose of this research was identifying socio-economic characteristics affected on respondents' participation in contract farming. The survey was conducted using structured questionnaire in populous states namely Kedah, Kelantan, Terengganu, Pahang, Perak, Selangor and Johor in Peninsular Malaysia. A total of one-hundred and sixty seven FFV farmers were randomly selected and personally interviewed. Logit analysis was carried out to identify determinants that influenced fresh fruits and vegetables (FFV) farmers participating in contract farming. The findings in the paper show that, based on the output from logistic regression, ownership, land size, education background, perceived benefit, complicated process, lacking in opportunities and price risk are dominant variables influencing FFV farmers' willingness to participate in contract farming. Land ownership, land size, education and perceived benefit are dominant variables that positively influenced FFV farmers to participate in contract farming. Complicated process, lack of opportunities and price risk negatively influenced FFV farmers' participation in contract farming.

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INTRODUCTION

The New Agriculture program, as proposed in the Ninth Malaysia Plan and of which contract farming is a part, has been supported and motivated by Malaysian government with the purpose of making agricultural production more profitable and competitive. Contract farming offers a means to effectively connect fresh fruits and vegetables farmers (hereafter referred to as FFV) farmers and large-scale retailers such as hypermarkets. Malaysian government are also recognized the potential of contract farming for transforming the structure of agriculture and raising farm income (Ninth Malaysian Plan).

In Malaysia, the development of modern retail outlets such as hypermarkets has seen tremendous growth since the 1990s. One of the observed impacts of the rise of hypermarkets in developing economies is the marginalization of small market intermediaries and farmers. A combination of various factors makes it difficult for FFV farmers to access and supply to hypermarkets. Hypermarkets respond to the demand for goods and services by consumers and basically maximize profits in the face of stiff competition from other retailers. To remain competitive and survive in the market place, hypermarkets set high quality standards for their fresh produce and offer low prices to consumers. To reduce transaction cost, hypermarket may integrate their supply chains and centrally procure products. Due to the high cost of transacting cost with small-scale farmers, hypermarkets prefers to source from large-scale farmers and therefore further marginalize small-scale farmers. While the risk of exclusion of smallholders is real, it is argued that there are opportunities as well (Fatimah Mohamed Arshad *et al*., 2006).

Contract farming would be an effective mechanism to integrate FFV farmers to the market and improve their livelihood. However, contract farming is a fairly new venture for the Malaysian agricultural sector that has emerged as a result of the government's agricultural industrialization programs (Arumugam *et al*., 2010).

The scale to which contract farming is practiced in Malaysia is difficult to assess since quantitative data are scarce and difficult to obtain. Lots of studies were carried out in Thailand and Indonesia indicating that this type of linkage is significant in those countries. Much of the literature assumes that producers predominantly contract to earn additional income. Although a subset of studies do acknowledge, or at least imply, individual farmers may contract for varying reasons.

This paper will broaden the understanding on FFV farmers' current marketing practices by ascertain the determinants for FFV farmers to be involved in contract farming.

In modern chains, contract farming is a means for vertical coordination that is growing in popularity. According to Singh (2002), contracts usually involve advance agreement between producers and purchasers on the some or all four parameters: price, quality, quantity (or acreage) and time of delivery. In contract, the specific terms and arrangements determine the ways of both parties share the benefits, costs and risks of coordination. Simmons *et al.*, (2005) mentioned that this type of arrangement will help to ensure a reliable supply for the buyers.

Morrison *et al*., (2006), stated that within last 30 years, contract farming has become an increasingly characteristic organizational form in global agrifood system, facilitating linkages between the various nodes of ever more complicated commodity complexes.

Da Silva (2005) indicated that such systems are becoming organized into tightly aligned chains and networks, where the coordination of production, processing and distribution activities is closely managed.

Arumugam *et al*., (2010) stated that there were five important factors motivate fresh fruits and vegetable farmers to involve in contract farming, namely, market stability, access to marketing information and technology, transfer of technology to improve farm practices, access to inputs and indirect benefit.

There is a limited body literature that qualitatively and quantitatively reported on the determinants of participation in contracts. In India, among the poultry producers, those who face lower opportunity cost of labor, which do not have other sources of income and engaged in small scale production, are more likely to par-

ticipate in contract farming. The effect of experience (as proxied by age) in poultry production on the likelihood of participation, while yielding a significant but negative coefficient, was perceived by authors to be indeterminate (Fairoze, *et al.*, 2006; Tiongco, *et al.*, 2006). Son *et al.*, (2007), stated that for pig producers in Vietnam, certain demographic characteristics influence farmers' decisions in enter into various types on contracts. Those who are older, more educated and spend more time in raising pigs are likely to engage in formal or informal contracts with cooperatives. But those who already devote more time to the pig-raising activity are less likely to enter into informal contracts with non-cooperative agents such as feed traders or output suppliers. Furthermore, farmers who have large landholdings are more likely to engage in formal contracts in pig production.

This paper examines the extent to which selected socio-economic or demographic characteristics and attitudes have influenced the respondents' participation in contract farming.

MATERIALS AND METHODS

Field surveys were conducted in the states of Kedah, Kelantan, Terengganu, Pahang, Perak, Selangor and Johor in Peninsular Malaysia. One hundred and sixty seven FFV farmers were randomly interviewed to obtain information regarding their participation in contract farming via a questionnaire. The questionnaire is divided into two sections; the first section included

Table 1: Explanatory Variables to Measure Determinants of FFV Farmers' Participation

Variables	Design value (Coding system)
Ownership	0.Not Owner
	1.Owner
Land Size	0.Less than 5 acres
	1.More than 5 acres
Education	0.Not Educated
	1.Educated
Perceived Benefit	0.No
	1.Yes
Complicated Process	0.No
	1.Yes
Lacking in Opportunities	0.No
	1.Yes
Price Risk	0.Flexible Price
	1.Fixed Price

some perceived benefits and risks like (i) the benefits that farmers obtain from engaging in contracts, (ii) the opportunities and constraints they face in engaging in contract farming, (iii) their capacities to comply with the requirements of such agreements, and (iv) the requirements that integrators of market intermediaries impose on farmers. The second elicit relevant socio-demographics such as level of education, age, land size and types of ownership.

From the survey, descriptive statistics on household demographics and farm characteristics were generated to determine and compare similarities and differences between contract and independent farmers. Using farmers and farm characteristics, a logit model was estimated to determine the likelihood of independent farmers to engage in either formal or informal contracts. The logit model for the representative farmer 'i' can be expressed as follows:

$$Y_i = \log \left(\frac{p_i}{1-p_i}\right) = a + \sum_{j=1}^{n} \beta x_{it} + e_i$$

Where; Y_i is an dependent variable "willing to be involved in contract farming" that had two categories such as "farmers are willing to be involved in contract farming" coded as one and "otherwise" coded as zero. The variable X_i represents the different attributes affecting the representative farmers' willingness. In this regression model, the vector consists of variables such as type of ownership, land size, price risk, perceived benefits, and lack of opportunities and education level of farmers (Table 1).

Where; $\log \left(\frac{p_i}{1-p_i}\right)$ is called log-odd ratio.

The Log-odd ratio is the logarithm of the odds that a particular purchasing choice will be made by the representative household. P_i is the probability of proxy variable $Y_i = 1$ and $(1 - P_i)$ is the probability of $Y_i = 0$ and e_i is the error term.

The interpretation of the estimated coefficients of the logit is a little tricky. The signs of parameter estimates and their statistical significance indicate the direction of the response associated with the presence or level of a particular

International Journal of Agricultural Management & Development, 1(2): 65-71, June, 2011.

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variable. The changes in the probabilities associated to the intermediate categories (1 to $j − 1$) cannot be signed a priori. Thus, category-specific marginal effects are often reported (Gujarati, 1988).

RESULTS AND DISCUSSION

Table 2 shows the socio-economic profile of independent farmers. From the survey, it was discovered that there were 167 independent farmers and 41 contract farmers. The Table 1 also illustrates that the majority 43 (25.7 per cent) of independent farmers were in the age category of between 51-60 years old. Forty-two (25.1 per cent) of the independent farmers were from the 41-50 years old category while 41 (24.6 per cent) of the independent farmers were from the age category of between 31- 40 years old. 28 (16.8 per cent) of the independent farmers were more than 61 years old while 13 (7.8 per cent) of the independent farmers were from 21-30 years old category. The findings show that 126 (75.4 per cent) of the independent farmers from the age category of 31-60 were actively involved in traditional farming in Peninsular Malaysia.

Out of the 167 independent farmer respondents, 147 (88 per cent) were male and 20 (12 per cent) were female. The traditional gender imbalance dominated by males associated with farming was present in FFV sectors. Eighty-seven (52.1 per cent) of the independent farmers were Malay, 64 (38.3 per cent) were Chinese, 12 (7.2 per cent) were Indians and 4 (2.4 per cent) were others.

In terms of education, the findings showed that of the independent farmers, 71 (42.5 per cent) had secondary education, followed by 57 (34 per cent) with primary education while 26 (15.6 per cent) were illiterate and 12 (7.2 per cent) of them had tertiary education. In terms of farming, 156 (93.4 per cent) of independent farmers were involved in a full-time capacity and 11 (6.6 per cent) of them were part-timers.

Fifty-seven (34.1 per cent) of the independent farmers have been involved in farming between 1-10 years, followed by 54 (32.3 per cent) of them between 11-20 years, 35 (21 per cent) of

them 21-30 years, 17 (10.2 per cent) of them for 31-40 years and 11 (2.4 per cent) of them more than 41 years.

Table 3 shows the farm size of the FFV independent farmers. The findings reveal that of the independent farmers, 19 (11.4 per cent) have farm size of less than one acre, 85 (50.9 per cent) had farm sizes of were between 1.01 – 5.00 acres. And 34 (20.4 per cent) own farms of between 5.01 – 10.00 acres in size. Only 6 (3.6 per cent) of the independent farmers have farm more than 40 acres. The average farm size was 3.70 acres for independent farmers. With regards to land tenure, Table 4 shows that 81 (48.5 per cent) of independent farmers owned the farms, followed by 59 (35.3 per cent) of independent farmers renting the farms. Two (1.2 per cent) of whom mortgage the farms while 18 (10.8 per cent) of independent farmers operate with a temporary occupation licence (TOL) farm.

The logit analysis was used to estimate the extent to which socio-economic or demographic characteristics and attitudes influenced FFV

Table 2: Sosio-economic Profile of Independent Farmers

Variables	Independent Farmers (n=167) %
Age	
21 - 30	7.8
31 - 40	24.6
41 - 50	25.1
51 - 60	25.7
> 61	16.8
Gender	
Male	88.0
Female	12.0
Ethnics	
Malays	52.1
Chinese	38.3
Indian	7.2
Others	2.4
Education Level	
No Education	15.6
Primary	34.0
Secondary	42.5
Tertiary Education	7.2
Farming Business	
Full Time	93.4
Part Time	6.6
Number of Years of Farming	
1 – 10	34.1
11 – 20	32.3
21 – 30	21.0
31 – 40	10.2
> 41	2.4

Source: Survey, 2007

Table 3: Farm Size Categories of Independent Farmers (acre) (%)

Farm Size (Acre)	Independent Farmers (%)
<1.00	11.4
1.01-5.00	50.9
5.01-10.00	20.4
10.01-25.00	8.4
25.01-40.00	5.4
>40.01	3.6

Source: Survey, 2007

farmers' willingness to participate or engage in contract farming.

The dependent variable "FFV farmers' willingness to participate in Contract Farming" which had two categories, namely "The farmers' willingness to be involved in contract farming" are coded as one and "otherwise" coded as zero. The estimated factor scores were then used in a binary logit analysis along with selected socioeconomic factors, such as ownership, land size, education, perceived benefit, complicated process, lacking in opportunities and risk (Table 1).

The estimated logit model was statistically significant with a Likelihood Ratio Test Probability of <0.0001, which indicates joint significance of all coefficient estimates. The estimated coefficients are tested by using standard errors, t-ratios and p-values. A positive sign on the statistically significant parameter estimates of one variable indicates the likelihood of the response increasing, holding other variables constant, and vice versa. Four variables were all positive and statistically significant, suggesting that response categories are indeed ordered properly. Thus, the farmers' characteristics in the ordered model equation are relevant in explaining their willingness towards contract farming. The results indicated that, the farmers' characteristics play an important role when explaining their will-

Table 4: Land Tenure Status of Independent Farmers (%)

Category	Independent Farmers (%)
Own	48.5
Rent	35.3
Mortgage	1.2
Government	4.2
TOL	10.8

Source: Survey, 2007

ingness towards contract farming.

Based on the statistically significant coefficients, OWNERSHIP is an important determinant for farmers' willingness to participate in contract farming, and the effect is positive (Table 5). This finding indicates an increasing likelihood to participate in contract farming for the farmers who have their own land. According to the results, farmers with their own land are more likely to be involved in contract farming rather than those who rent their land.

Table 5 also presents the estimate odds ratio. The odds ratios are calculated by the binary logit coefficients (Probability = [odd / (1-odd)]) and it means that farmers with their own lands are 3.447 more interested in contract farming compared to others. The estimated odd ratio of farmers with bigger lands (more than 5 ACRE) is 2.475 times higher than the farmers with smaller land, indicating that these farmers are more inclined to be involved in contract farming. Education level of farmers, which is significant at the 0.01 willingness (significant) level, has positive and significant effect on the probability to be involved in contract farming. Educated farmers are more likely to be involved in contract farming. The odd ratio for education is 3.271 more than not educated farmers. Respondents who indicated an interest in contract farming are 2.28 times more likely to be involved in this arrangement as compared to those who indicated otherwise. Meanwhile the "complicated process" affects farmers negatively. This suggests that the farmers who find the requirements difficult to be involved in contract farming are 0.647 less likely to be involving in contract farming.

The response "No Opportunities" negatively influences the probability of farmers' willingness towards contract farming i.e., 0.653 times less likely. It is anticipated that the "less opportunities" for farmers to participate in contract farming, the less they are likely to be involved in contract farming. Results of logit model indicate a negative relationship between the farmers' willingness towards contract farming and "contract farming is not beneficial activity". Estimated coefficient for "no benefit from contract farming" is negative and statistically significant at 99 per

Table 5: Logit Model Estimates for Determinants of FFV Farmers' Participation

Variables	Estimated Coefficients	Standard Error	Z Statistic	P-value	Ratio
Age	0.000461	0.009641	0.047817	0.9619	1.00046110
Gender	0.057977	0.063893	0.907408	0.3653	1.05969062
Ownership	1.237584***	0.046402	26.67092	0.0000	3.44727478
Farming Business	0.116771	0.074192	1.573903	0.1172	1.12386203
Size of Land	0.906397***	0.056009	16.18306	0.0003	2.47538762
Experience	0.036697	0.045358	0.809052	0.4195	1.03737864
EDUCATION (Educated, NOT Educated)	1.185002***	0.047868	24.75562	0.0002	3.27069336
Perceived Benefit	0.818849***	0.048196	16.98998	0.0000	2.26788799
Complicated Process	-0.434352***	0.120374	-3.60835	0.0004	0.64768423
Lack of Opportunities	-0.425062***	0.124893	-3.40341	0.0008	0.65372925
Prick Risk	-0.433633***	0.118681	-3.65377	0.0003	0.64815008
C	-0.398667	0.130476	-3.05548	0.0026	0.67121417
McFadden R-squared	0.539585	Log likelihood		-13.94119	
S.D. dependent var	0.382900	Restr. log likelihood		-91.496	
P-value for the Goodness of Fit test	0.0000	Avg. log likelihood		0.451433	

cent level of confidence. Farmers who do not find contract farming as beneficial activity are less likely to be involved in this agreement compared to others.

In order to assess how well the model fits the data, Goodness-of-Fit test statistic was developed and a chi-square test from observed and expected frequencies was computed. As shown in Table 5, the model for has a P-value of 0.000, which confirms that the fit of the model is good.

The results suggest that most farmers view contract production favorably and would like to be involved in contract farming if offered the opportunity. The primary reason farmers do not participate in contract farming is the lack of opportunity due to lack of interest from contractors operating in their area. Investment in public infrastructure such as roads and transportation will induce retailers to invest in fresh fruits and vegetable farming. Farmers strongly identify price fluctuation as the key disadvantage to contracts where the farmers prefer a stable income for their produce. Several price strategies often used in contracts are suggested in this context. The flexible price strategy specifies that the goods transaction price be equal to the market price at delivery. The fixed price strategy means that the delivery price would be fixed in advance of signing contracts. The fixed price provision is favored by most farmers because it limits downside risk exposure. The primary perceived benefits like quality improvement of products, stabilizing the sale price and lowering marketing costs were likely to be more influential for farmers to be involved in contract farming. Moreover farmers with larger farms and with relatively high yields were also more likely to adopt contract farming. Educational level also was a significant determinant in a farmer's decision to participate in contract farming program.

The results from this study indicate that, given adequate infrastructure and an enabling policy environment, vertical coordination has the potential to contribute toward improving the contract farming program among the fresh fruit and vegetables farmers in Malaysia. However, this has not been backed up by legal instruments that provide protection to producers as well as to processors against problems like moral hazards, willful defaults, and the like. A proactive role by the government is needed to provide adequate legal protection to facilitate sharing of risks and benefits for both contracting parties.

CONCLUSION

The paper determines that seven variables influence FFV farmers' willingness to participate in contract farming. Four variables such as land of ownership, land size, education and perceived benefit positively influenced FFV farmers' to participate in contract farming. Three variables, namely complicated process, lack of opportunities and price risk negatively influenced FFV farmers' participation in contract farming.

RECOMMENDATIONS

Contract farming is emerging as an important form of vertical coordination in agro-food markets in Malaysia, and its economic and social consequences are attracting considerable attention in the food policy debates. This paper has examined the determinants, which are likely to influence fresh fruits and vegetables farmers to participate in contract farming. The fruit and vegetable sectors in Malaysia are mostly dominated by smallholders, and from the point of view of the retailer, contracting with a large number of smallholders is a very complicated process. This problem can be overcome by contracting with a single person in the village, often an agent, who acts as an intermediary between the retailer (hypermarkets) and producers.

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International Journal of Agricultural Management & Development, 1(2): 65-71, June, 2011.

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