Journal of Developments in Sustainable Agriculture 6: 181−188 (2011)

Succession Decisions on Family Farms in Nakhon Si Thammarat Province, Thailand

Kanjana Kwanmuang*

Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Ibaraki 305−8572, Japan

Shortages of household successors and labor will pose a challenge to the agricultural sector in Thailand. Since 1989, agricultural employment has decreased. The decrease has been especially sharp among the 15- to 24-year-old age group, because many young workers took up employment in other sectors, educational enrollment has increased, and declining population growth rates have reduced their numbers. In addition, the move toward an aging society and the decline in the number of younger people who want to work in farming will lead to a shortage of agricultural labor and farm successors. Hence, succession plans for the future of family farms are of serious concern. The aim of this study was to analyze the decisions of heads of farming families regarding successors. A survey of 237 farming families was conducted in the harvest season in 2011 in Nakhon Si Thammarat province, southern Thailand. The age of the household head, the value of agricultural land, the value of non-agricultural household assets, the younger generation's experience in farming, and the irrigation ratio all significantly influenced the household head's plans for succession. The household head's education level was not, however, a significant factor because of the competing effects of the head' s better management ability and the better non-farm job opportunities afforded to the educated younger generation.

Key words: succession decisions, agricultural successor, agricultural policy, socio-economic household survey, bivariate probit and logit model

1. Introduction

In Thailand, the number of agricultural households increased from 5.513 million in 1998−99 to 5.778 million in 2006−07, an annual increase of 0.59%. In contrast, in the same period, the agricultural population decreased from 26.4 million to 22.7 million (−1.90% p.a.), and agricultural labor decreased from 18.8 million to 15.8 million (−2.20% p.a.) (Information Center of Agriculture, Office of Agricultural Economics, 1999 and 2007). Agricultural employment has also decreased: between 1989 and 1995, the number of persons employed dropped by 17.56%. This decrease was especially sharp among the 15- to 24-year-old age group, in which it dropped by 44% (Poapongsakorn *et al*., 1998). And between 1995 and 2011, the number of persons employed dropped by 31.65% and the decrease was also especially sharp among the 15- to 24-year-old age group, in which it dropped by 49.06% (National Statistical Office, 2011) because many young workers took up employment in other sectors, educational enrollment increased, and declining population growth rates have reduced their numbers. These trends show that Thailand will face a shortage of agricultural labor and household successors in the near future. In addition, the move toward an aging society and the decline in the number of younger people who want to work in farming will further decrease numbers.

Hence, succession plans for the future of family farms are of serious concern. Kimhi and Nachlieli (2001) stated, "The existence or absence of successors on family farms could be an indication of the long run prospects of the survival of those farms: farms without successors will most likely gradually fade away." However, Mishra and El-Osta (2008) stated that even

Received: October 1, 2011, Accepted: November 1, 2011

* Corresponding author: Office of Agricultural Economies Zone 8, 131 Tharathipbodee Road, PhunPhin, Suratthani, Thailand.
Tel: (Cell) +(66) 77311641, E-mail: kanjanak@oae.go.th

though succession decisions on family farms are important, few studies of these matters have been conducted; and I cannot find any such research in Thailand. The aim of this study, therefore, was to analyze the decisions of heads of Thai farming families concerning successors on their farms.

The decisions of household heads concerning successors are influenced by many factors. Kimhi & Lopez (1999) studied succession decisions in Maryland, USA. Determinants of decisions included farmers' age, farmers' education, the number of years spent working off-farm, upbringing on a farm, inheritance of the farm from parents, farm size, and family income. Kimhi and Nachlieli (2001) studied an intergenerational succession family farm in Israel. Factors influencing the probability of having a successor included the age of the farm operator (the probability first increased with increasing age and then later decreased), the education of the operator, and the age of the oldest child. However, farms with more land had lower probabilities of having a successor. Glauben *et al*. (2002) studied intergenerational succession in upper Austria in terms of the probability of succession, the likelihood of having a successor designated, and the timing of succession. The number of family members and the farmers' experience significantly influenced succession and the designation of a successor. Large farms and specialized farms were more likely to be transferred within the family and to have a successor appointed. The age of the farm operator had the same effect as in Israel. Mishra and El-Osta (2008) studied the effect of agricultural policies on succession decisions in the USA. Decisions were significantly influenced by government farm policy, farm wealth, and the age and education of the current farm operators.

Against this background, I posed eight hypotheses concerning succession on Thai farms. (1) Age would positively affect the succession decision and increase the household head's hope of a successor; older farmers are more likely to plan for a successor. (2) Non-agricultural income would negatively affect the succession decision: households with more non-agricultural income are less likely to plan for a successor, as off-farm work or non-agricultural occupations are more attractive than agriculture. Such household heads would encourage their children to work in other sectors and pay less attention to succession planning. (3) Debt would negatively affect the succession decision: higher household debt means lower farm profitability, so farming work is less attractive than other work. (4) The value of agricultural land, the value of other agricultural assets, and the value of non-agricultural household assets would all positively affect the succession decision. (5) The level of education of the household head would affect the succession decision both positively and negatively. On the one hand, a higher level of education implies better management abilities or skills, which the next generation can learn. On the other hand, it implies greater opportunities to give children a better education, making them more likely to work off-farm, thus decreasing the possibility of a succession decision. (6) The experience of the younger generation in farming would positively affect the succession decision. The household head is more likely to choose a successor with farming experience. (7) The irrigation ratio would positively affect the succession decision: irrigation can increase crop production and income and reduce risk, and so farmers with a higher irrigation ratio are more likely to plan for succession. (8) The crop would influence the succession decision. In particular, rice would negatively affect the decision on account of the many challenges to rice farming, including unstable weather, increasing of costs of inputs, lack of irrigation, and heavy labor. Thus, rice farmers would be more likely to encourage their children to work in another sector and would be less likely to plan for a successor. In contrast, perennial crops are easier to manage, and therefore a successor would be more likely.

2. Materials and Methods

2.1 Study area

Nakhon Si Thammarat province is located in southern Thailand on the Gulf of Thailand (Fig. 1). It is subdivided into 23 districts (*amphoe*), 165 subdistricts (*tombon*), and 1428 villages (*muban*). The total land area of the province is 994 250 ha, of which about 484 112 ha (48.7%) is agricultural. Only 122 480 ha (25.3% of agricultural land) is irrigated. Natural forest covers about 188 140 ha (18.9% of the province), and about 322 000 ha (32.4%) is non-agricultural land. The province has a population of 1 513 168, of whom 781 446 (51.6%) are farmers (Information Center of Agriculture, Office of Agricultural Economics, 2007). The farmers of Nakhon Si Thammarat province grow a variety of crops. The main cash crops are rubber in the

west, perennial crops and timber in the center, rice in the east, and shrimp and fish on the coast (Fig. 1). Oil palm tree, vegetables, and livestock are raised in small areas. I divided the farming families into five categories determined by their main crop: rice for sale, rice for consumption, Oil palm tree, perennial crops (rubber and fruit), and fisheries.

2.2 Estimation models and data

Estimation models

I tested the decisions concerning succession planning by empirical means. Decisions were rated as discrete choices, and binominal probit and logit models were used to test which variables affect the succession decision. As well as to check the robustness of results with respect to the assumptions of the model, the significant results were choose from 2 model to explain the succession decision. Like, Kimhi and Nachlieli (2001) employed the probit results and semi-non-parametric alternative (SNP) to check the robustness of results.

Logit and probit model for binary response were used. In a binary response model, primary response probability as $P(y=1|x)=P(y=1|x_1, x_2, ..., x_k)$, where **x** is the full set of explanatory variables (Wooldridge, 2006).

The logit and probit model can be considered a class of binary response models of the form

$$P(y=1|x)=G(\beta_0+\beta_1 x_1+.....+\beta_k x_k)=G(\beta_0+\mathbf{x}\boldsymbol{\beta}),$$

Where G is a function taking on values strictly between zero and one: $0<G(z)<1$, for all real numbers. And, $\mathbf{x}\boldsymbol{\beta}=\beta_1 x_1+.....+\beta_k x_k$ (Wooldridge, 2006).

Even thought binominal probit and logit models are

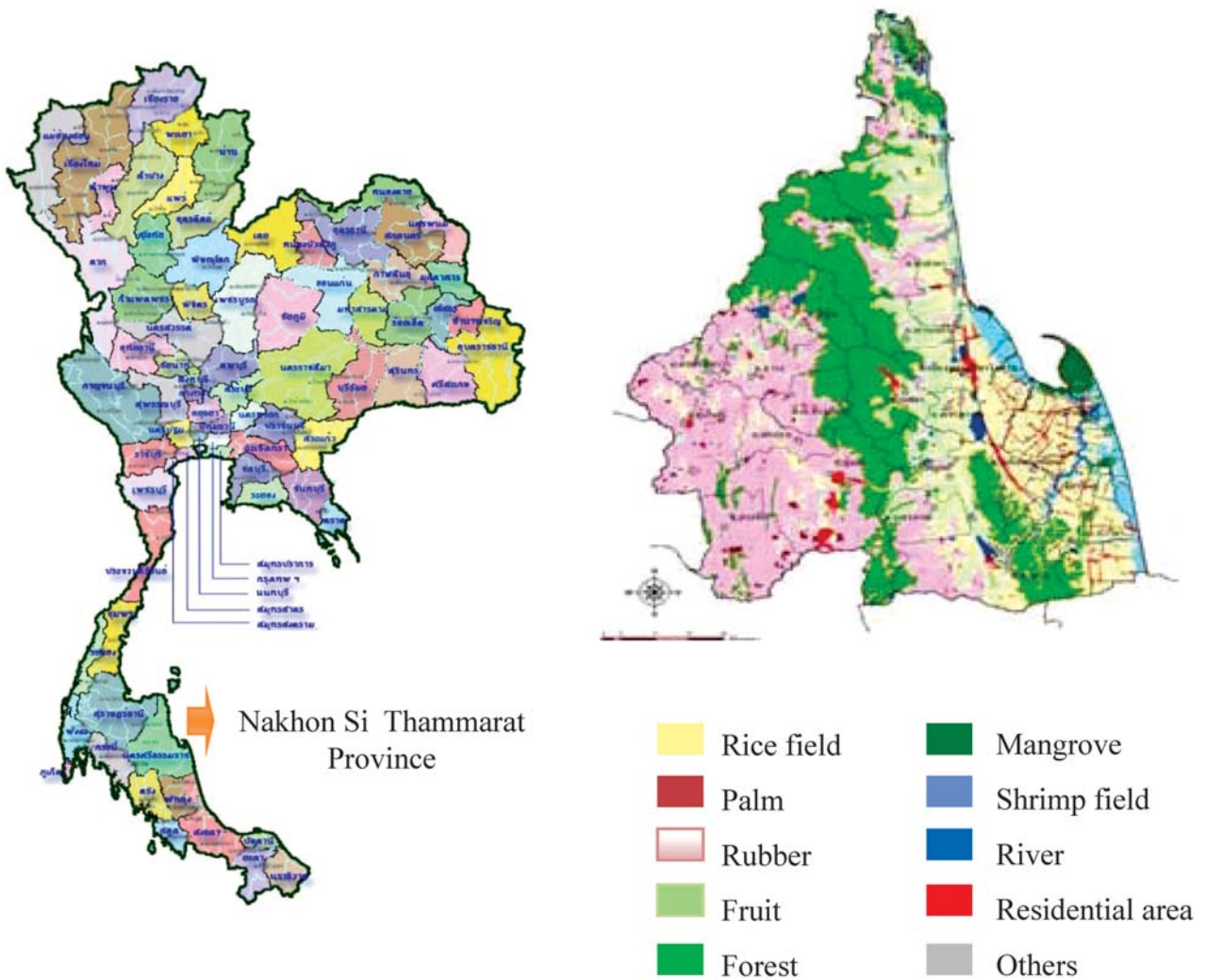

Fig. 1. Maps of Thailand and Nakhon Si Thammarat Province.

similar, the settings of distribution of error term are different as probit models was estimated by standard normal distribution for the error term $f(x)=\frac{1}{\sqrt{2.\pi\sigma^2}}e^{\frac{(x-\mu)^2}{2.\sigma^2}}$ where $\mu=0,\sigma^2=1$

Whereas, logit models was estimated by standard logistic distribution for the error term $f(x)=\frac{e^{-(x-\mu)/s}}{s(1+e^{-(x-\mu)/s})^2}$, $f(x)=\frac{1}{1+e^{-(x-\mu)/s}}$, where μ: *mean*, s: *scale*, the variance is $\pi^2 s^2/3$. $\mu=0$, $s=1$

The Goodness of fit measure were also estimated for predicting percent correct of the model was adopte by *Mc Fadden* (1974) as *Mc Fadden* $R^2=1-\frac{\ln L_{ur}}{\ln L_r}$, where $\ln L_{ur}$ estimated log livelihood in the original model and $\ln L_r$ estimated the log livelihood in the model without explanatory variables.

The marginal effect of the binominal probit and logit models which estimated the probability change for a succession decision (*successor*=1) from the marginal change in explanatory variable X_j

$$\frac{\partial P_i}{\partial P_j}=\frac{\Delta\{1-F[-(\beta_0+\beta_1 X_{i1}+....+\beta_k X_{ik})]\}}{\Delta X_j}$$

$=\beta_j f[-(\beta_0+\beta_1 X_{i1}+.....+\beta_k X_{ik})]$, where f (.) is the density function of error term.

Therefore, in this study, the 2 models can be adapted as follow equation:

$$successor=c+b_1 age+b_2 eduHH+b_3 non\_agri\_income+b_4 debt+b_5 value\_landasset+\beta_6 other\_agriasset+\beta_7 non\_agri\_asset+\beta_8 gen\_help+\beta_9 irr\_ratio+d1+d2+d3+d4$$

Where *successor* is dependent variable: successor is planned=1; successor is not yet planned=0, whereas explanatory (independent) variables are explained in table 1. The Goodness of fit and also the marginal effect were estimated in this study.

Data collection and sampling

Data were collected from 237 households by questionnaire in the harvesting season of 2011. The household were selected by using stratified two – stage sampling. Villages were grouped into stratum according to their zone as primary sampling unit and random for sample villages. In each sample village, the mapping lists of households were collected as secondary sampling unit and use simple random for sample households. Families were interviewed in regard to household characteristics (sex, education, age, and non-farm work by members), land tenure and use, farm production, income, expenditure, debt, and household properties or assets (Table 1). The succession plan of each household head was recorded as either planned or not yet planned. Data was analyzed using Gretl program. Household heads were further asked about their feelings about working in agriculture (Table 2) and about their plans for a future successor and that person' s situation in the household (Table 3).

3. Results and discussion

Over 62% of household heads took pride in their work (Table 2). Yet 50% were not sure about whether they were succeeding in agriculture, and 39% questioned the stability of farming as a career. Over 46% were unsure about whether they were accepted by other occupations in their community. Over 150 household heads (64%) would support their children's choice to be agriculturists, and 130 (55%) were sure that their children would be happy with this choice (Table 3). Households averaged 2.8 children. Half of all households had children helping on the farm, but there were twice as many sons as daughters.

The results for the logit and probit analyses are presented for all farms, rice farms, and perennial crop farms (Table 4); fisheries are excluded on account of limited data.

The probit estimates of all farms indicate that the age of the household head, the value of agricultural land, the value of non-agricultural household assets, the younger generation's experience in farming, and the irrigation ratio all significantly influenced the succession decision. However, the value of non-agricultural household assets did not.

The age of the household head had a positive effect in all farms ($P=0.10$) and in rice farms ($P=0.05$), but no effect in perennial crop farms. Thus, as the age of the household head increases, the head will become more aware of the need to make succession plans, particularly on rice farms. This result is consistent with hypothesis 1, as well as other studies (Kimhi and Nachlieli, 2001; Glauben *et al*., 2002; Mishra and El-Osta, 2008). The marginal effect of age was to increase the probability of a succession decision by 0.62 %.

The value of agricultural farmland had a positive effect on the succession decision ($P=0.10$): A higher value of holdings increased the probability of a decision. However, the marginal effect was not signifi-

Table 1. Definition and descriptive statistics of variables.

Variable	Definition	Farms with succession plan Mean (SD)	Farms without succession plan Mean (SD)	Total farm Mean (SD)
Successor	Succession decision of household head (successor is planned=1; successor is not yet planned=0)	1.0000	0.00000	0.46835
Age	Age of household head (years)	56.946 (10.881)	51.833 (12.702)	54.228 (12.132)
Education	Level of education of household head 1=no education 2=primary school 3=high school 4=college/bachelor degree 5=>bachelor degree	2.2883 (0.59372)	2.5476 (0.81591)	2.4262 (0.73056)
Own_area	Farmers own land (ha/household)	4.291 (3.727)	3.255 (3.611)	3.741 (3.694)
Agri_income	Agricultural income (THB/household)	367 420 (902 600)	298 830 (435 720)	330 955 (693 875)
Non-agri_income	Non-agricultural income (THB/household)	96 078 (98 818)	116 110 (172 520)	106 730 (142 890)
Debt	Household debts (THB/household)	110 270 (186 430)	115 710 (196 540)	113 164 (191 480)
Agri_asset[(a)]	Total value of agricultural household assets (THB/household)	2 195 700 (2 003 700)	1 646 800 (1 796 100)	1 903 897 (1 911 900)
value_landasset[(b)]	Value of agricultural land (THB/household)	1 960 900 (1 956 100)	1 459 900 (1 721 300)	1 694 540 (1 848 100)
other_agriasset[(c)]	Value of other agricultural assets (farm machinery & equipment, breeding stock, farm buildings; THB/household)	234 760 (401 700)	186 980 (289 530)	209 357 (346 680)
Non-agri_asset	Value of non-agricultural household assets (THB/household)	603 810 (643 250)	725 640 (917 290)	668 578 (801 400)
Gen_help	Younger generation's experience in farming	0.66667 (0.47354)	0.34127 (0.47603)	0.49367 (0.50102)
Irr_ratio	Irrigation ratio (irrigation area/total area)	0.55320 (0.48784)	0.41964 (0.48147)	0.48219 (0.48802)
Dummy 1	Farmers who grow rice for sale	0.48649	0.50794	0.49789
Dummy 2	Rice for consumption	0.081081	0.11111	0.097046
Dummy 3	Palm	0.29730	0.26984	0.28270
Dummy 4	Perennial plants (rubber and fruit)	0.10811	0.087302	0.097046
Dummy 5	Fisheries	0.027027	0.023810	0.025316

[a] Total value of agricultural household assets (THB/household) includes value of agricultural land and value of other agricultural assets.

[b] Value of agricultural land as assessed by the Bank for Agriculture and Agricultural Cooperatives.

[c] Value of other agricultural assets; depreciation was determined by the straight-line method as $D_{SL}=(C-S)/N$, where C is acquisition cost (price of new asset), S is residual value of asset, and N is number of years of using that asset.

Table 2. Attitude of household head toward being an agriculturist.

Pride and satisfaction in being agriculturist	Strongly agree	Agree	Undecided or neutral	Disagree	Strongly disagree
You love and take pride in agriculture	11.6	62.2	24.1	2.1	0.0
You succeed in practicing agriculture	5.0	36.5	50.2	8.3	0.0
Farming offers a stable career	4.6	39.0	39.4	13.7	3.3
You are accepted by other occupations or sectors in your community	5.4	44.0	46.1	4.6	0.0

Numbers show the percentages of respondents in each category

Table 3. Planning for future successor of household head and situation of successor in household.

Opinion	Yes	No
Planning for future successor of household head		
Will you support your son or daughter to be an agriculturist?	151 (63.71)	86 (36.29)
Will your son or daughter be satisfied to be an agriculturist?	130 (54.85)	107 (45.15)
Situation of successor in household		
Average number of sons and daughters in family	2.82	
Do you have any sons or daughters helping on the farm?	117 (49.37)	120 (50.63)
If yes: number of sons helping on the farm (average)	1.03	
If yes: number of daughters helping on the farm (average)	0.52	

Percentage of household heads shown in parentheses

cant. This result is consistent with the studies of Glauben *et al*. (2002), which used farm size, and Mishra and El-Osta (2008), which used farm capital stock. Possibly, an increase in the value of the land attracts the younger generation to farming and their wish to inherit the farm. However, these results contradict those of Kimhi and Nachlieli (2001), who found that farms with more land were less likely to have a successor: larger farms might offer a lower incentive to invest in capital-intensive infrastructure, which requires less labor and thus means less demand for a successor; or larger farms might be more attractive to real estate investors, so the higher asset value made parents delay their succession decision. In contrast, the value of other agricultural assets (present value of farm machinery and equipment, breeding stock, and farm buildings) did not influence the succession decision.

The value of non-agricultural household assets (house, non-farm machinery and equipment, and household appliances) had a negative effect on the succession decision ($P=0.10$), contrary to hypothesis 4. The probable reason is that in Thailand, particularly in this province, farmers divide their assets equitably among their children: agricultural assets to the successor and non-agricultural assets to the other children. This increases the value of the non-agricultural assets to the non-farming children. Another possible reason is that the household head keeps these assets in retirement, hence delaying the succession decision. However, this variable affected the decision only in the probit model, However, the marginal effect was not significant.

The younger generation's experience in farming had a positive effect on the succession decision ($P=0.01$), particularly in perennial crop farms. The marginal effect was to increase the probability of a decision by 29%. A possible explanation is that the household head finds it easier to choose a successor who has experience on the farm.

The irrigation ratio had a positive effect on the succession decision ($P=0.10$) in all farms. The marginal effect was to increase the probability of a decision by 14%. The irrigation ratio represents infrastructure investment by government in agriculture. As the irrigation ratio increases, the household head will

Table 4. Logit and probit results and marginal effect of variables affecting succession decision of household head.

Variables	All farms				Rice farms				Perennial plant farms (palm, rubber, fruit)			
	Logit results		Probit results		Logit results		Probit results		Logit results		Probit results	
	Coeff.	ME	Coeff.	ME	Coeff.	ME	Coeff.	ME	Coeff.	ME	Coeff.	ME
Intercept	−1.9485		−1.1612		−2.4082		−1.4424		−1.2952		−0.8199	
	(1.2111)		(0.7363)		(1.4298)		(0.8554)		(2.1446)		(1.2565)	
Age	**0.0249***	0.0062	**0.0148***	0.0058	**0.0441****	0.0108	**0.0263****	0.0103	−0.0152	−0.0038	−0.0080	−0.0032
	(0.0137)		(0.0082)		(0.0185)		(0.0109)		(0.0269)		(0.0152)	
Non-agricultural income	-9.53×10^{-8}	-2.36×10^{-8}	-2.44×10^{-8}	-9.67×10^{-9}	1.61×10^{-6}	3.94×10^{-7}	9.44×10^{-7}	3.71×10^{-7}	-2.08×10^{-6}	-5.21×10^{-7}	-1.03×10^{-6}	-4.13×10^{-7}
	(1.43×10^{-6})		(7.84×10^{-7})		(1.32×10^{-6})		(8.68×10^{-7})		(2.41×10^{-6})		(1.39×10^{-6})	
Debt	-2.23×10^{-7}	-6.04×10^{-8}	4.67×10^{-9}	1.85×10^{-9}	-2.88×10^{-7}	-7.03×10^{-8}	1.68×10^{-7}	6.61×10^{-8}	-9.68×10^{-7}	-2.42×10^{-7}	-6.43×10^{-7}	-2.56×10^{-7}
	(1.39×10^{-6})		(7.40×10^{-7})		(2.01×10^{-6})		(1.04×10^{-6})		(1.92×10^{-6})		(1.17×10^{-6})	
Value of land assets	$\mathbf{1.42\times10^{-7}}$*	3.53×10^{-8}	$\mathbf{8.85\times10^{-8}}$*	3.51×10^{-8}	1.62×10^{-7}	3.97×10^{-8}	9.93×10^{-8}	3.90×10^{-8}	1.69×10^{-7}	4.23×10^{-8}	1.02×10^{-7}	4.07×10^{-8}
	(8.64×10^{-8})		(5.17×10^{-8})		(1.31×10^{-7})		(7.98×10^{-8})		(1.25×10^{-7})		(7.51×10^{-8})	
Other agricultural assets	6.72×10^{-7}	1.67×10^{-7}	3.56×10^{-7}	1.41×10^{-7}	1.77×10^{-6}	4.32×10^{-7}	9.35×10^{-7}	3.67×10^{-7}	-2.83×10^{-7}	-7.08×10^{-8}	-1.88×10^{-7}	-7.48×10^{-8}
	(7.13×10^{-7})		(3.65×10^{-7})		(1.25×10^{-6})		(6.89×10^{-7})		(8.25×10^{-7})		(4.90×10^{-7})	
Non-agricultural assets	-5.93×10^{-7}	-1.47×10^{-7}	$\mathbf{-3.47\times10^{-7}}$*	-1.38×10^{-7}	$\mathbf{-1.19\times10^{-6}}$*	-2.92×10^{-7}	$\mathbf{-6.48\times10^{-7}}$*	-2.55×10^{-7}	-1.07×10^{-7}	-2.67×10^{-8}	-1.02×10^{-7}	-4.08×10^{-8}
	(3.64×10^{-7})		(1.99×10^{-7})		(6.94×10^{-7})		(3.56×10^{-7})		(4.29×10^{-7})		(2.66×10^{-7})	
Younger generation experience	**1.2349*****	0.2974	**0.7518*****	0.2916	0.5583	0.1364	0.2980	0.1171	**2.5155*****	0.5452	**1.5150*****	0.5411
	0.3239		(0.1911)		(0.4535)		(0.2532)		(0.5797)		(0.3183)	
Education	−0.1889	−0.0468	−0.1222	−0.0485	−0.3739	−0.0913	−0.2329	−0.091	0.1620	0.0404	0.0959	0.0382
	(0.2495)		(0.1484)		(0.2909)		(0.1766)		(0.6068)		(0.3353)	
Irrigation ratio	**0.5739***	0.1424	**0.3452***	0.1369	**1.0695****	0.26612	**0.6318*****	0.2482	0.5821	0.1454	0.3301	0.1316
	0.3274		(0.1936)		(0.4192)		(0.2416)		(0.6995)		(0.3682)	
Dummy 1	0.1365	0.0338	0.0742	0.0294								
	(0.5513)		(0.3287)									
Dummy 3	−0.2371	−0.0584	−0.1462	−0.0577								
	(0.5633)		(0.3378)									
Dummy 4	0.2134	0.0532	0.1047	0.0417								
	(0.6934)		(0.4131)									
Dummy 5	1.0700	0.2545	0.6431	0.2474								
	(1.1347)		(0.7019)									

ME: marginal effect of unit change in each independent variable on succession decision.

1) Robust standard errors in parentheses. 2) Significance: * 10%; ** 5%; *** 1%. 3) Number of observations: total farms, 237; rice farms, 141; perennial plant farms, 90.

4) McFadden R^2 goodness-of-fit: total farms, 0.1351, rice farms, 0.1645; perennial plant farms, 0.2241.

5) Number of cases correctly predicted	Logit results	Probit results
Total farms	67.5%	66.7%
Rice farms	70.9%	71.6%
Perennial plant farms	76.7%	76.7%

be more sure of reducing risk, especially in rice farming, and therefore will be more confident in making a succession decision.

The education level of the household head did not influence the succession decision because of the competing effects of the better management ability of the head and the better non-farm job opportunities afforded to the educated younger generation. In addition, debt and crop type did not affect the decision.

4. Conclusions and recommendations

Thai farmers often ask how Thai agriculture will survive if younger people leave the sector. This study cannot directly answer this question, but it can at least explain which type of family farm is more likely to have a succession plan, and which is less likely.

As expected, older household heads, heads with more land assets, and heads with a high irrigation ratio, particularly on rice farms, are more likely to plan for succession, especially if they have children who already work on the farm.

An unexpected result is that the value of non-agricultural household assets (house, non-farm machinery and equipment, and household appliances) had a negative effect on the succession decision, perhaps because the household heads want to keep these assets in their retirement, thus delaying their succession decision.

To support agriculture, the Thai government should focus on younger household heads, farmers with less valuable land or wealth, and farmers without children who work on the farm. In particular, government should support irrigation on rice farms, as it "has increased the amount of land under cultivation, and the yields on existing cropland. It has also allowed double cropping, and has decreased the uncertainty of water supplied by rainfall" (Schoengold & Zilberman, 2004); and as yields of most crops in Asia have increased by between 100% and 400% after irrigation (FAO, 1996).

5. Acknowledgements

I am deeply thankful to my supervisor, Dr. Hisato Shuto, School of Life and Environment Sciences, University of Tsukuba, for his kindness, motivation, support and useful suggestions. I am also thankful to Professor Ryuichi Shigeno for his warm welcome and further suggestions. I thank all staff of the Japan International Cooperation Agency (JICA) and the Japan International Cooperation Center, especially Ms. Nakata Yukimi, Ms. Naoko Sakuma and Ms. Kimiko Shinoda, for their assistance throughout this course.

I am grateful to Mr. Apichart Jongskul, Secretary General, Office of Agricultural Economics, Mr. Wittaya Chaisuwan, Inspector General, Ministry of Agriculture and Co-operatives, and Mr. Anusorn Pornchai, Director, Office of Agricultural Economics (zone 8), for their encouragement and support throughout this study. I also thank all my colleagues, particularly Mr. Charnchai Sasitorn and Ms. Pritsadee Matbut, for collecting data.

I am grateful to JICA for the financial support that made it possible for me to study in Japan. I thank all the farmers in Nakhon Si Thammarat province for their useful data and kind welcome; I could not have succeeded without their support. Lastly, I thank my family for their constant support, motivation and encouragement during my stay in Japan.

References

FAO, 1996. Agriculture and Food Security. World Food Summit. Food and Agriculture Organization of the United Nations, Rome.

Glauben, T., Tietje, H., Weiss, C, 2002. Intergenerational succession on family farms: evidence from survey data. Working Paper EWP 0202. Department of Food Economics and Consumption Studies, University of Kiel, Germany.

Information Center of Agriculture, Office of Agricultural Economics, 1999. Research on Economic, Social, Household, and Agricultural Labor Situations for FY 1998/1999. A-one Future Company Limited. Bangkok, Thailand.

Information Center of Agriculture, Office of Agricultural Economics, 2007. Research on Economic, Social, Household, and Agricultural Labor Situations for FY 2006/2007. A-one Future Company Limited. Bangkok, Thailand.

Kimhi, A., Lopez, R., 1999. A note of farmers' retirement and succession consideration: Evidence from a household survey. J. Agric. Econ. 50 (1), 154−162.

Kimhi, A., Nachlieli, N., 2001. Intergenerational succession on Israeli family farms. J. Agric. Econ. 52, 42−58.

Mishra, A.K., El-Osta, H.S., 2008. Effect of agricultural policy on succession decisions of farm households. Rev. Econ. Household 6, 285−307.

National Statistical Office, 2011. Labor Force Survey 2011, Round 3, Bangkok, Thailand

Poapongsakorn, N., Ruhs, M., Tangjitwisuth, S., 1998. Problems and outlook of agriculture in Thailand. TDRI Quart. Rev. 13 (2), 3−14.

Schoengold, K., Zilberman, D., 2004. Water and development: the importance of irrigation in developing countries. http://are.berkeley.edu/courses/ARE253/2004/handouts/Bretton_Woods.pdf (accessed 27 Sep 2011).

Wooldridge J., 2006. Introduction Econometrics: A Modern Approach. Michigan State University. USA.