

Rural population ageing and farm structure in Thailand

by

John Bryant and Rossarin Gray

Population and Development Service
Sustainable Development Department



Food and Agriculture Organization of the United Nations
September 2005

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The word "countries" appearing in the text refers to countries, territories and areas without distinction.

The Food and Agriculture Organization of the United Nations encourages the dissemination of material contained in this publication, provided that reference is made to the source.

All rights reserved. Reproduction and dissemination of material in this information product for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of material in this information product for resale or other commercial purposes is prohibited without written permission of the copyright holders. Applications for such permission should be addressed to the Chief, Publishing Management Service, Information Division, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy or by e-mail to copyright@fao.org

© FAO 2005

Table of contents

1	Introduction	1
2	Background information on ageing and agriculture in Thailand	2
2.1	Demography	2
2.2	Health	4
2.3	Thai agriculture and agricultural policies	4
2.4	Family and household	5
3	The rural population and agricultural workforce, 1985–2003	6
4	Differences between farms headed by old people and farms headed by young people	11
4.1	Data and methods	11
4.2	Labour	13
4.3	Use of land.....	15
4.4	Type of production.....	17
4.5	Orientation to the market.....	20
4.6	Use of technology	21
4.7	Use of credit market	24
4.8	Income	25
5	Discussion	26
5.1	Summary of results.....	26
5.2	Implications	28
	Poverty and vulnerability	29
	Recommendations for further research	29
	Policy implications	30
	Acknowledgements	31
	References	31
	Appendix – Data used in figures	33

Bryant, John and Gray, Rossarin. Rural population ageing and farm structure in Thailand. Rome, FAO, 2005. 38 p.

Abstract

In Thailand, as in much of the developing world, rapid declines in mortality and fertility are now leading to rapid population ageing – increases in the proportion of older people in the population. Agriculture now has the oldest workforce of any economic sector in Thailand, and further ageing is expected. Some commentators have suggested that older farmers are less likely to mechanize, adopt new crops, and apply new technologies. Some have also suggested that a sub-population of impoverished rural elderly may be emerging. This report uses data from Labour Force Surveys for the period 1985-2003 to document the extent of ageing in Thai agriculture. It then uses a previously unexploited information source – the 2003 Agricultural Census – to assess whether older farmers do in fact differ systematically from younger farmers. The differences investigated include use of fertilizers, pesticides, and machinery, access to land and credit, and the value of agricultural output. In most cases the differences are surprisingly small. There are, however, some intriguing gender differences: for instance, older women are more likely to own the land they use, and less likely to have debts, than older men. The report concludes by discussing policy implications.

This paper was prepared by Dr. John Bryant and Dr. Rossarin Gray, researchers from the Institute for Population and Social Research, Mahidol University, Thailand.

Rural population ageing and farm structure in Thailand

1 Introduction

In Thailand, as in much of the developing world, rapid declines in mortality and fertility are now leading to rapid population ageing. The shift towards older age structures is particularly marked in the agricultural workforce, where demographic changes have been reinforced by the tendency of young people to seek non-agricultural employment.

The international literature on the economics of ageing often suggests that old people may be less flexible and less open to new technology than young people. A recent FAO global review of ageing and rural development (Stloukal 2004) suggests that, because of ill health, relatively low literacy, discrimination in credit markets, and shorter investment horizons, old people may be slower to adopt new crops and technologies than young people, may be less market-oriented, and may be less inclined to make long-term investments. Moreover, there may be differences in the opportunities and constraints facing older men and older women. The report points out, however, that age differences and gender differences depend on local contextual factors such as inheritance rules, population health, and agricultural practices. In the Republic of Korea, for instance, rural population ageing may actually have assisted rural development by hastening land consolidation. The report notes that empirical research on links between ageing and rural development is very limited.

Thai agriculture is currently diversifying away from rice, and becoming more capital intensive and market-oriented. Some scholars have argued that older farmers are less able or willing to participate in this transformation:

Improved transportation and communications, constant population flows to and from the capital, rural industrialization, and the expansion of state services (police, irrigation, roads, electricity, health, etc.) have now defined a mixed economy where agriculture is specializing in high value cash crops and where the younger generation has little commitment to farming. The full consequences of these changes still remain to fully materialize and will appear along with the gradual retirement of farmers (especially rice farmers) over 50 years old (Molle and Srijantr 2003: 23).

If older people are slower to adapt to the changing opportunities in agriculture, a sub-population of impoverished elderly may emerge (Siamwalla 2004).

This report examines whether farms headed by older Thais do in fact differ systematically from those of younger Thais. First, it presents some background information on population, agriculture, and household formation in Thailand. It then documents trends in the demographic structure of Thailand's rural population and agricultural workforce. Next, it compares farms headed by old people with farms headed by young people in terms of size, crops grown, orientation to the market, use of machinery, use of chemical inputs, access to credit, and output; a summary of the variables examined is given in Table 1. Based on the observed differences, the report draws inferences on how ageing is likely to affect agricultural production and rural poverty, and suggests some policy implications.

The analysis of demographic trends is based mainly on seven rounds of Thailand’s Labour Force Survey, covering the period 1985–2003. The Labour Force Survey is carried out by the National Statistical Office, and conforms to International Labour Organization guidelines on matters such as the definition of employment. The analysis of differences between younger and older farmers is based on the one-percent sample from the 2003 Agricultural Census, another product of the National Statistical Office. As Stloukal (2000) points out, agricultural censuses are a valuable source of information on rural ageing. Agricultural censuses have, however, been little-used by social scientists in Thailand. The report also draws on population censuses, various surveys, and on the secondary literature.

Some important aspects of ageing and rural development, such old people’s food security or their contribution to maintaining cultural traditions, are not dealt with here, as they would require different information sources. Our focus is on population, employment, and production.

Table 1. Age and gender differences in farming practices that are investigated in the study

Topic	Variable used
Labour	Household members working on holding Percent of holdings hiring permanent employees Percent of holdings hiring temporary employees
Land	Area used by holding Percent of area used by holding that is owned by holding
Type of production	Percent of holdings growing crops, raising livestock, carrying out aquaculture and performing other agricultural activities
Orientation to market	Production for consumption or sale Importance of non-agricultural income
Use of technology	Use of machinery Ownership of 2-wheel tractor Use of fertilizer Use of pesticides
Use of credit	Proportion of holdings with debt, by source of debt Amount borrowed; interest rates

2 Background information on ageing and agriculture in Thailand

2.1 Demography

The Thai population is ageing rapidly, due to declines in fertility and mortality. Thai fertility began falling in the late 1960s, and reached replacement level (2.1 births per woman) in the early 1990s. Life expectancy is now around 70 years. As a result, the proportion of Thais aged 60 or over increased from 4.8% in 1960 to 10.5% in 2005, and is likely to reach about 25% by 2040.¹ The figure of 25% is similar to what the UN projects for many developed countries in 2040.

¹ United Nations Population Division, *World Population Prospects: The 2004 Revision*, online database, www.esa.un.org/unpp/.

The cohorts of Thais who began having families after the onset of fertility decline are beginning to reach old age. As a result, the numbers of living children per old person is falling. Table 2 shows two survey estimates of living children per woman aged 60 and over, and some projected values for 2020. The projected values were calculated using the model described in Bryant (2005) and data from the one-percent sample from the 2000 Population Census.² The proportion of elderly women with only one child or no children is set to increase from about 12% at present to about 30% in 2020. The proportion of elderly woman with four or more children will fall dramatically. Such changes may substantially increase rural old people's vulnerability. As discussed below, children are still the main source of financial assistance for rural old people who are unable to support themselves.

Table 2. Percent distribution of Thai woman aged 60 and over by numbers of living children, 1994–2020

Number of living children	1994 Survey of the Elderly in Thailand	2002 Survey of the Elderly in Thailand	Projected values for 2020
0	4.4	5.2	14.4
1	5.8	6.4	16.6
2	8.0	11.6	28.7
3	12.7	15.3	20.3
4+	69.1	62.3	20.1
Total	100.0	100.0	100.0
Mean	4.9	4.5	2.4

Note: The estimates and projections include never-married and ever-married women.

Sources: Survey estimates from Knodel et al. (2005: Table 1). Projected values calculated by the authors using the model described in Bryant (2005) and data from the one-percent sample of the 2000 Census.

Table 3. Percent of population living in rural areas, 1960–2000

1960	1970	1980	1990	2000
87.5	86.8	83.0	81.3	68.3

Source: Population and Housing Censuses.

The proportion of the Thai population living in rural areas has been declining, as can be seen in Table 3. The large decrease in the 1990s is partly an artifact of definitional changes: peri-urban 'sanitary districts' that had previously been classified as rural were re-classified as urban in 2000. Even after the reclassification, however, Thailand still had an unusually high proportion of its population in rural areas, given that it is now a middle-income country. (The World Bank estimates that Thailand's Gross National Income per capita in 2003 was US\$2,190.³)

² The Census data yields give substantially lower estimates of living children at ages 60 and over than the 2002 Survey of the Elderly in Thailand. The main reason for the discrepancy is probably under-reporting in the Census, which, unlike the Survey of the Elderly, did not use National Statistical Office enumerators. The projected results for 2020 are based mainly on data on living children for people aged 40-59 in 2000. Data for this group are almost certainly subject to less under-reporting than data for older people, so the projected results are probably subject to a much smaller downward bias than the Census estimates for people currently aged 60 and over.

³ World Bank, Thailand Data Profile online data, www.worldbank.or.th, accessed May 2005.

2.2 Health

Unsurprisingly, survey data show that old people in Thailand tend to have worse health than young people. Table 4 shows some representative data from the 2003 Health and Welfare Survey. However, the financial burdens created by ill health are not as great for Thai old people as they are for old people in many developing countries. Calculations by the authors, based on the 2003 Health and Welfare Survey, show that 99% of people aged 60 and over in rural Thailand are covered by at least one form of health insurance, whether public or private. Eighty-seven percent of these people are covered by the government's 'Thirty Baht Scheme', in which patients are supposed to pay 30 baht (about US\$0.75), or make no payment, for treatment at government health centers and hospitals. The insurance system seems to provide genuine financial protection. Of the 30% of old people who had visited any type of public or private health provider in the month before the 2003 Health and Welfare Survey, 65% paid nothing, and only 15% paid 100 baht or more.

Table 4. Percent of rural population who reported a chronic illness, by age and sex, 2003

Age	All rural people		Rural people employed in agriculture	
	Males	Females	Males	Females
15–39	8	12	8	14
40–59	21	33	20	32
60–69	39	53	35	47
70+	53	56	52	45

Source: Calculated by the authors from the 2003 Health and Welfare Survey.

However, for old people whose children are dying of AIDS, it is the children's ill health, not their own, which imposes the financial burden. Around 1.5% of Thais aged 15 and above are HIV-positive.⁴ Wachter, Knodel and VanLandingham (2003) estimate that around 8% of Thais aged 50 and over in 1995 were likely to lose at least one child to AIDS during their lifetime. AIDS death rates are highest in the North of Thailand. However, despite claims in the popular media, the AIDS epidemic is unlikely to leave large numbers of Thai old people with no children to support them. For instance, hypothetical projections that remove the effects of the AIDS epidemic yield estimates of living children in 2020 that are only one percentage point lower than the data shown in Table 2. Fertility decline has done far more than AIDS to reduce the number of living children per old person (Bryant 2005: 117–8).

2.3 Thai agriculture and agricultural policies

Compared to most of the rest of Southeast Asia, Thailand has been distinguished by a high ratio of land to people. This has contributed to high rates of land ownership, a high proportion of the workforce employed in agriculture – the World Bank estimates that 46% of the workforce was employed in agriculture in 2003 – and low yields per hectare, relative to other Southeast Asian countries (Siamwalla 1991). In 2002, the value-added per agricultural worker (i.e. GDP from agriculture divided by the number of agricultural employees) in Thailand was still about the same as that in Indonesia and the Philippines, which are both much poorer than Thailand. Value-added per agricultural worker was only a fraction of that in Malaysia.

⁴ World Bank, *Thailand Data Profile* online data, accessed May 2005.

Accordingly, agriculture made up only 9 percent of Thailand's GDP in 2003, despite accounting for nearly half the workforce⁵. Another consequence is that rural Thailand is visibly poorer than urban Thailand.

Starting in earnest in the late 1980s, competition from the manufacturing and service sectors began to force up the price of agricultural labour. As indicated in Table 5, real agricultural wages increased by a factor of three between 1985 and 2003. (It is worth noting, incidentally, that older people shared in the wage increases.) Farmers responded by substituting capital for labour (Coxhead and Plangraphan 1998). The number of tractors per hectare of arable land, for instance, increased about four times during the 1990s.⁶

Table 5. Real average hourly wages for agricultural employees (2003 Thai baht), by age and sex, 1985 and 2003

Age	1985		2003	
	Males	Females	Males	Females
15–39	5.4	4.8	15.9	14.2
40–59	5.9	4.3	17.1	13.4
60–69	5.0	5.0	14.1	12.2
Total	5.5	4.7	16.2	13.7

Source: Authors' calculations based on data from the Labour Force Surveys.

Many commentators argue that Thailand's publicly-funded agricultural research and extension programs have not been particularly effective. Most new crops, technologies or inputs are introduced by farmers themselves, or by agricultural companies, rather than by the public sector. Government programs to introduce new crops, techniques, or technology have often received little input from farmers, leading to disappointing results (Sirisup and Kammeier 2003).

Thai agricultural production has traditionally been dominated by rice. Over recent years, however, farmers have been diversifying. Notable new agricultural activities have included flower-growing, vegetable-growing, and aquaculture, which provide much higher incomes for a given area of land (Molle and Srijantr 2003).

As in many developing countries, a significant proportion of the workforce in rural areas is employed in industries other than agriculture. By 2003, the proportion of rural employees working outside agriculture had reached 38%, compared with 20% in 1985. The two main sources of non-agricultural employment were transportation (15%) and manufacturing (11%).⁷

2.4 Family and household

Most ethnographic descriptions of Thai rural families are based on data from the 1960s and 1970s, when there was a boom in anthropological research on the subject. The anthropologists agreed that Thais had a matrilineal stem family system. The husband usually moved into the

⁵⁵ All statistics cited in this paragraph come from the World Bank *World Development Indicators* online database <http://publications.worldbank.org/WDI>.

⁶ Ibid.

⁷ Authors' calculations based on data from the 1985 and 2003 Labour Force Surveys.

wife's household for some period following marriage. If the wife had a younger sister, the couple would move out once the younger sister married. The youngest sister and her husband would remain in the household of the parents until both parents had died. Although it was the husband, rather than the wife, who moved, the husband was expected to be the household head. There was, of course, some regional variation in the rules, and many individual families did not conform to the cultural ideal for reasons such as a lack of daughters or a family dispute. Families of Chinese immigrants, found particularly around Bangkok, followed a patrilocal system, where the wives moved in with the husbands (Mizuno 1968: 851; Foster 1975: 36–42; Keyes 1975: 282; Potter 1977; Sharp and Hanks 1978: 56; Kemp 1982).

The standard account of inheritance in the 1960s and 1970s was that property was distributed equally among all children, except that the child who remained with the parents (typically the youngest daughter) would receive the house or extra rice land (Foster 1975; Potter 1976: 159–60). The standard account was, however, incomplete in the case of northeast Thailand. Studies there found that rice land was ideally given only to daughters, with sons given movable property such as buffalos (Mizuno 1968: 851–2; Keyes 1975: 286–8). There are in fact hints of a similar tradition elsewhere in Thailand. In northern Thailand, sisters tended to buy out the land of their brothers, particularly if the brother was marrying outside the village (Potter 1976: 129; Potter 1977: 19).

Throughout Thailand, ethnographers of the 1960s and 1970s noted that the transfer of land and authority from the parents' generation to the children's generation occurred at the time of the parents' deaths in some families, and earlier in others, and was often a cause of familial tension. Children frequently received use-rights to land before they received formal title (Yanu 1968: 858–9; Keyes 1975: 288; Potter 1977: 101; Kemp 1982: 109–10).

Relatively little anthropological research has been undertaken on Thai families since the 1970s. There have, however, been many large, nationally-representative surveys, which have provided abundant information on co-residence and old-age support. The surveys confirm the existence of a matrilineal stem family system. Until recently, they have also shown the proportion of old people living with one or more children to be remaining steady at 70–80% (with estimates varying according to question wording), despite concerns in the media about the erosion of traditional family values. Surveys since the year 2000 have found some reduction in co-residence. However, the proportion of old people who either live with their children or maintain daily contact has remained high. There is also abundant evidence of absent children remitting money or goods to their parents, and maintaining contact even when separated (Gray 2004; Knodel, Chayovan et al. 2005).

3 The rural population and agricultural workforce, 1985–2003

This section lays out the basic demography of rural and agricultural ageing in Thailand, and documents how educational attainment and work status vary by age and gender. The data come mainly from the Labour Force Survey. The definitions used in the survey conform to those of the International Labour Organization, so the data are internationally comparable. Questionnaires, a description of sample selection, and summary results for the Labour Force Surveys can be found on the National Statistical Office website www.nso.go.th. We use data for the years 1985, 1988, 1991, 1994, 1997, 2000, and 2003. All rounds used in our analysis refer to August, the time of peak agricultural activity.

Rural Thailand continues to have higher fertility and higher mortality than urban Thailand, which suggests that rural Thailand ought to have a younger age structure. However, in Thailand, as in most countries (Skeldon 1997: 34), rural-urban migration is most common among young adults. In 2000, for instance, 15% of Bangkok residents aged 15–24, but only 6% of residents aged 25 and over, had moved to Bangkok within the previous 5 years.⁸ The result, as Table 6 and Table 7 show, is that Thailand’s rural and urban populations have maintained very similar age structures, at least among adults. In both rural and urban areas, the population aged 15 and over had a median age⁹ of 30 years in 1985, and 36 years in 2003.

Table 6. The demographic structure of the rural population aged 15 and over

	1985	1988	1991	1994	1997	2000	2003
<i>Percent of population</i>							
Age 15–39	69.2%	67.8%	67.3%	66.4%	59.5%	58.0%	56.2%
Age 40–59	22.2%	23.1%	23.3%	23.9%	28.4%	29.2%	30.5%
Age 60+	8.6%	9.1%	9.4%	9.8%	12.2%	12.8%	13.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Sex ratio*	103.9	99.9	100.0	98.7	100.1	100.9	100.9
Median age	30	30	31	32	35	35	36
Popn (millions)	26.0	28.8	31.1	33.4	34.9	31.3	32.0

Source: Authors’ calculations based on data from the Labour Force Surveys.

*Males per 100 females

Table 7. The demographic structure of the urban population aged 15 and over

	1985	1988	1991	1994	1997	2000	2003
<i>Percent of population</i>							
Age 15–39	71.0%	69.2%	67.7%	65.0%	62.6%	60.2%	58.2%
Age 40–59	21.2%	22.4%	23.6%	25.7%	27.2%	28.4%	30.0%
Age 60+	7.8%	8.3%	8.7%	9.3%	10.3%	11.4%	11.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Sex ratio*	95.8	94.9	94.8	91.5	93.1	93.2	92.9
Median age	30	31	32	33	34	35	36
Popn (millions)	6.4	6.9	7.5	8.2	9.7	15.3	16.4

Source: Authors’ calculations based on data from the Labour Force Surveys.

*Males per 100 females

Tables 6 and 7 do, however, reveal one important rural-urban difference: in rural areas there were 100.9 males per 100 females in 2003, while in urban areas, there were only 92.9. The

⁸ Author’s calculations based on the one-percent sample from the 2000 Census.

⁹ The median age is the age of the person in the middle of the distribution, when the population is arranged from youngest to oldest. For instance, if the population consisted of one person aged 29, one aged 30, and one aged 34, the median age would be 30 (while the mean would be 31). The median is a more sensible measure of the “middle” of a distribution than the mean when the distribution is not symmetric.

leading cause is probably that females are more likely than males to work in urban manufacturing industries.

Rural employment ratios (the employed population divided by the total population) remained fairly stable between 1985 and 2003, apart from a decline in employment among the young (Table 8). Over the long run, this decline is attributable mainly to rising educational enrollments. The sudden drop in manufacturing jobs after the 1997 crisis is, however, evident in female employment rates in 1997–2000 (Gray 1999: 39). Slightly more than one half of elderly men, and slightly more than one quarter of elderly women, meet the ILO criteria for being classified as employed. Older people who do not meet the criteria are not necessarily living a life of leisure. Many of the older women who describe themselves as ‘housewives’, for instance, make a crucial contribution to the household economy by preparing food, looking after the house, and minding children.

Table 8. Percent of rural population that is employed, by age and sex

	1985	1988	1991	1994	1997	2000	2003
<i>Males</i>							
Age 15–39	87	89	89	85	82	78	80
Age 40–59	96	96	96	96	95	96	96
Age 60+	55	57	54	53	50	50	54
Total male	86	88	88	85	82	80	82
<i>Females</i>							
Age 15–39	78	81	79	75	71	66	67
Age 40–59	81	85	80	81	80	78	79
Age 60+	27	29	29	28	28	25	29
Total female	74	77	74	71	68	64	65

Source: Authors’ calculations based on data from the Labour Force Surveys.

Between 1985 and 2003, significant numbers of younger rural workers began to find jobs outside agriculture. Table 9 shows changes in employment ratios. In 2003, 78% of the rural male workforce aged 15–39 was employed in agriculture; by 2003 this proportion had fallen to 59%. For females, the reduction was even larger, from 80% to 53%. In contrast to the young, the rural workforce aged 40 and over has experienced only small declines in agricultural employment rates.

The effects of the 1997 economic crisis are visible in Table 9. After falling continuously for 12 years, the proportion of rural male workers who were employed in agriculture jumped 5 percentage points between 1997 and 2000, before resuming its downward course. The temporary return to agriculture was far less pronounced for females, leading to a dramatic rise in the ratio of males to females in the agricultural workforce.

Table 9. Percent of rural workforce employed in agriculture, by age and sex

	1985	1988	1991	1994	1997	2000	2003
<i>Males</i>							
Age 15–39	78	76	69	63	58	62	59
Age 40–59	79	76	73	68	64	69	66
Age 60+	86	84	83	80	80	81	81
Total male	78	76	71	66	61	66	63
<i>Females</i>							
Age 15–39	80	77	70	66	60	60	53
Age 40–59	83	82	77	74	69	72	68
Age 60+	82	77	73	76	75	74	72
Total female	81	79	72	68	64	65	60

Source: Authors' calculations based on data from the Labour Force Surveys.

Note: 'Employed in agriculture' is defined here to mean working at least one hour a week in agriculture. We calculated a similar table in which people were only counted as 'employed in agriculture' if they worked 20 hours a week, but the results were very similar.

The reduction in agricultural employment among rural young people has compounded the effects of rural ageing to produce rapid ageing in the agricultural workforce.

Table 10 gives the numbers. The proportion of the agricultural workforce under 40 years of age fell by almost 20 percentage points between 1985 and 2003. The proportion aged 60 or more doubled, though from a low base. The agricultural workforce now has a higher median age than that of any other Thai industry (Table 11).

Table 10. Demographic structure of agricultural workforce

	1985	1988	1991	1994	1997	2000	2003
<i>Age-structure</i>							
Age 15–39	70.8%	69.3%	68.1%	65.7%	57.3%	54.3%	51.4%
Age 40–59	24.7%	25.9%	26.7%	28.5%	35.1%	37.9%	39.4%
Age 60+	4.5%	4.8%	5.2%	5.8%	7.7%	7.8%	9.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Sex ratio*	113.6	110.7	116.2	113.1	115.3	127.4	133.5
Median age	30.0	30.0	31.0	33.0	36.0	38.0	39.0
Popn (millions)	16.6	18.4	17.9	17.4	16.4	14.8	14.5

Source: Authors' calculations based on data from the Labour Force Surveys.

*Males per 100 females.

Table 11. The median age and sex ratio of the workforce in Thai industries, 2003

Industry	Median age	Sex ratio*
Agriculture	39	134
Services	37	100
Transportation	37	802
Commerce	36	92
Others	36	627
Construction	35	604
Manufacturing	31	80

Source: Authors' calculations based on data from the 2003 Labour Force Survey.

*Males per 100 females.

One reason why rapid ageing raises concerns about the dissemination of new crops and technology in Thai agriculture is the strong association between age and educational attainment in Thailand. Mass education only began in the 1950s, and not until recently did progression to secondary school become common. As Table 12 shows, most people under 40 years of age who are employed in agriculture have completed elementary school, while most people over 40 have not.

Table 12. Percent distribution of agricultural workforce by educational attainment, 2003

	Males			Females		
	15–39	40–59	60+	15–39	40–59	60+
No education	2.4	4.2	10.7	3.8	8.7	17.8
Lower than elementary	15.3	84.1	84.8	21.6	87.2	81.2
Elementary	49.8	3.7	1.8	52.1	2.1	0.5
Secondary	30.2	7.1	2.2	21.1	1.8	0.5
Diploma or equivalent	1.7	0.5	0.1	0.7	0.2	0.0
Bachelor or higher	0.5	0.3	0.3	0.6	0.1	0.1
Other	0.1	0.1	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations based on data from the 2003 Labour Force Survey.

Note: 'Employed in agriculture' defined as working at least one hour per week in agriculture.

Old people and young people working in agriculture also differ in their work status (Table 13), though this probably reflects life-cycle effects, rather than differences between cohorts. An employee is someone who earns wages or salary. Employers and 'own account workers' are both self-employed; employers pay wages and salaries to others while own account workers do not.¹⁰ By age 40 a large majority of men have become 'own account workers'. These statistics are consistent with the description of the Thai household lifecycle given in Section 2.4. When young, some men establish their own farms, while others work on the farm of their father or father-in-law. In time, the fathers and fathers-in-law die or retire, and by age 40 most men have become heads. Women are more likely to remain 'unpaid family workers' throughout their life, although by 60 years, one-third have become 'own account workers'. In many cases, these women's husbands will have died or retired.

¹⁰ Definitions of employment status and some cross-national statistics are available at the *Key Indicators of the Labour Market* (KLIM) website of the ILO, www.ilo.org/public/english/employment/strat/kilm/indicats.htm

Table 13. Work status of agricultural workforce, by age and sex, 2003

	Males			Females		
	15–39	40–59	60+	15–39	40–59	60+
Employee	16.7	11.1	6.2	15.2	13.1	9.7
Employer	1.8	5.2	4.9	0.8	1.4	1.8
Own account worker	37.0	77.4	83.1	18.3	26.0	34.4
Unpaid family worker	44.5	6.3	5.8	65.7	59.5	54.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations based on data from the 2003 Labour Force Survey.

Far fewer people describe themselves as 'employees' or 'employers' than describe themselves as 'own account workers' or 'unpaid family workers'. The latter two categories refer to people working on family farms, which continue to dominate the Thai countryside.

4 Differences between farms headed by old people and farms headed by young people

The ageing of the agricultural workforce only affects agricultural production to the extent that the choices and capacities of old people differ from those of young people. Accordingly, this section investigates whether the farms headed by old people differ from those headed by young people.

4.1 Data and methods

All quantitative data for this section come from the one-percent sample of the 2003 Agricultural Census, collected by the National Statistical Office. Consistent with FAO recommendations, the census covers all 'holdings' in the country, where a holding is defined as follows:

A holding is an economic unit of agricultural production (cultivating crops, rearing livestock and culturing fresh water) under single management comprising all livestock kept and all land used wholly or partly for agricultural production purposes, without regard to title or legal form (National Statistical Office No date: 17).

Holdings include family farms, companies, government agencies, or any other organization that carries out agricultural production. Our analysis is, however, confined to family farms. The role and responsibilities of the holder in a company or government agency are quite different from those of a holder in a family farm, and the two cannot safely be compared, and as noted above, family farms still predominate in rural Thailand. Our sample contains a total of 66,195 holdings, which is 10–20 times larger than a standard household survey. Households that have members working on other people's farms but do not themselves carry out agricultural production are not included in the census or in our sample.

The person who manages the holding is known as the 'holder':

A holder refers to a civil or juridical person who exercises management control and takes major decisions over the agricultural holding operation. The holder has technical and economic responsibility for the holding and may undertake all responsibilities directly, or delegate responsibilities to a hired manager. A hired manager participating in economic and financial responsibilities in addition to managing the holding is considered a holder (National Statistical Office No date: 18).

Questionnaires and summary results for the 2003 Agricultural Census are available at the National Statistical Office website www.nso.go.th. Stloukal (2000) discusses the methodology of agricultural censuses, and their appropriateness for studying rural ageing.

Holders in the Thai Agricultural Census correspond approximately to own-account workers in the Labour Force Surveys. As expected, the age-sex-profile of holders closely resembles that of own-account workers in Table 13. When we refer to ‘farms headed by old people’ this is shorthand for ‘household holdings in which the holder is old’. ‘Old’ generally means ‘aged 60 and over’, though we also make three-way comparisons between people aged 20–39, people aged 40–59, and people aged 60 and over.

The question we are investigating is whether old farmers are slower than young farmers to adopt new crops and technologies and are less oriented to the market. We compare farms headed by old people with the farms headed by young people. If we find, for instance, that farms with old holders are less likely to use fertilizer than farms with young holders, we interpret this to mean that old farmers are less willing or able to use fertilizer than young farmers. The comparisons are mainly carried out using graphs, because these reveal patterns and differences much more readily than tables. The data on which the graphs are based are shown in tables in the Appendix.

Comparisons between young and old holders are only informative to the extent that the holders identified in the Agricultural Census make the important decisions, as required by the census definition. In practice, holders are likely to share some authority with other household members. Potential rivals for authority exist in many holdings: 33% of holders aged 60 and over have at least one male household member aged 20–59 who works part-time or more on the holding, and some holders only work part-time on the holding themselves. Insofar as old holders do share authority with younger household members, differences between holdings with old holders and holdings with young holders will understate the true difference in the production choices of old and young. Anthropological research on the division of authority between generations could in principle provide some guidance on the extent of joint decision-making and hence the size of this measurement bias. But, as noted in Section 2.4, there has been little anthropological research on rural families for the past 20–30 years.

We have addressed the issue of shared responsibility by checking our results for all holdings against results for a sub-sample where holders are likely to exercise substantial authority. The sub-sample consists of 6,578 holdings in which the holder works full time and no one else works more than part-time, implying that the holder does not need to share authority.

Unfortunately, while addressing one problem, the sub-sample introduces a new problem of its own. Under the traditional Thai household lifecycle, holdings headed by old people ought to have children and children-in-law helping on the farm. The holdings that qualify for our sub-sample are therefore unusual, and care needs to be taken when extrapolating from the sub-

sample to the whole population. Holdings in the sub-sample may, for instance, be disproportionately likely to have low-quality land, since this is one potential reason why young people are not helping. The full sample and sub-sample therefore need to be used together, with attention paid to the limitations of each. In practice, the sample and sub-sample generally give similar results.

When interpreting the results of the comparisons, attention also needs to be paid to other implications of the household lifecycle. Some differences between holdings headed by old people and holdings headed by young people are probably attributable to the household lifecycle, rather than attitudes to technology or the market. For example, all else equal, old people are more likely to own land than young people because young people are still waiting to inherit. However, Thai farmers' ready access to credit (discussed below) means that some lifecycle effects are dampened, since young farmers can borrow against future earnings. We discuss lifecycle effects on a case-by-case basis.

When interpreting the results, it is also important to bear in mind that we are comparing the population of old farmers to the population of young farmers, not the population of all old people to the population of all young people. People who farm are likely to differ systematically from people who do not. Among the elderly, an important difference may be that farmers are healthier than non-farmers, since only people who are healthy can continue working. More speculatively, it is possible that old people who are wealthy are less likely to continue farming than old people who are poor, since the wealthy can afford to retire. This means that our comparisons do not measure the effect of age alone; instead they measure the joint effect of age plus whatever selection process is determining farming status. It is not possible, with the available data, to separate age and selection effects. This does not matter to assessments of the effect of ageing on production, if it can be assumed that the selection effects will be roughly constant over time. It does, however, matter for the analysis of poverty, since it means that generalizations about farmers are unlikely to hold true for the rural population as a whole.

Comparison of holdings is, then, an imperfect way of assessing differences in the attitudes and abilities of old and young farmers, and the results need to be interpreted with care. Moreover, the study of rural farmers answers only some of the questions that might be asked about poverty among rural elderly. Analysis of the Agricultural Census does, nevertheless, allow us to make progress on issues for which empirical research is severely limited, in Thailand and elsewhere.

4.2 Labour

We look first at differences in the amount of household labour used on different types of farm. Age-differences in use of household labour can be readily explained by the household life cycle: older holders are likely to have children and children-in-law working with them. The differences in household labour therefore say little about the production choices made by young and old farmers and are included here mainly as background to later comparisons.

Table 14 shows the number of household members working on the holding. We have weighted household members according to the amount of time they spend working on the holding. Members who said that they worked only on the holding were counted as one worker; those who said they worked mainly on the holding, and partly elsewhere were counted as 0.75 of a worker; and those who said they worked mainly elsewhere and partly on

the holding were counted as 0.25 of a worker. The weighting system is somewhat arbitrary, but we are constrained by the limited information available from the census. A person can be a holder even if he or she only works part time on the holding, so holders receive weights of 0.25, 0.75, or 1. On average, male holders aged 60-plus contribute 46% of total labour on their holdings, and female holders aged 60-plus contribute 54%.¹¹

As Table 14 shows, the number of workers per holding increases steadily with the age of the holder. This is what would be expected, based on the Thai household lifecycle. Female holders have slightly fewer workers than male holders. This is probably because many women become holders at the death or departure of their husbands.

Table 14. Mean number of household members working on the holding, by age and sex of holder

	20–39	40–59	60+
Male	1.8	2.1	2.4
Female	1.7	1.9	2.1

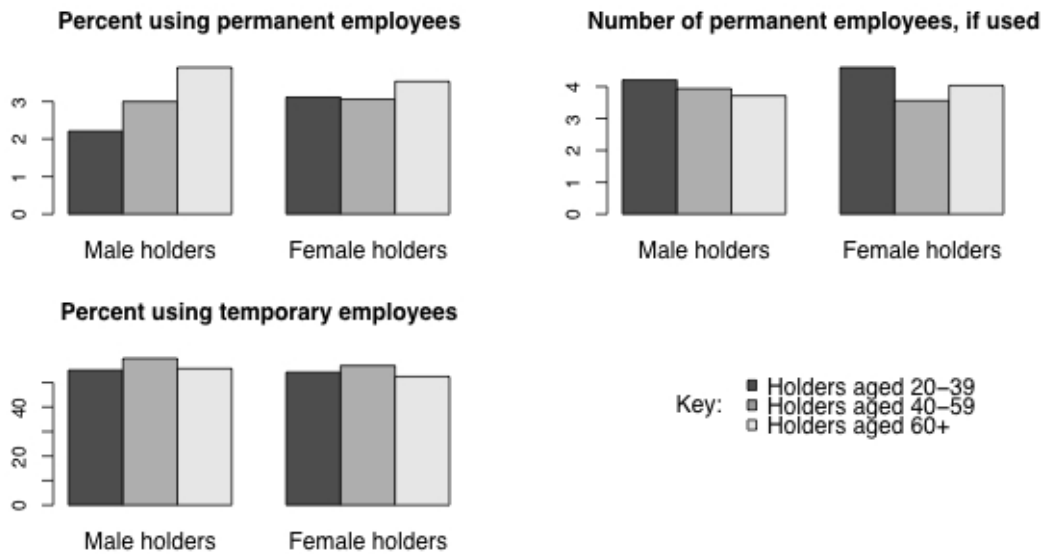
Note: Workers receive a weighting of 0.25, 0.75, or 1 depending on whether they work part-time or full-time; see the text for details.

Source: Authors’ calculations based on the 2003 Agricultural Census.

Figure 1 shows data on the use of hired labour, as opposed to household labour. Older holders might be expected to hire permanent employees more often than young holders, because old people need more assistance with physically demanding tasks. The left graph in the top-left panel of Figure 2 shows that 2% of farms headed by male holders aged 20–39 hire permanent employees, while the equivalent estimates for male holders aged 40–59 and 60 and over are 3% and 4%. There is, in other words, a positive association between the age of the holder and the probability of hiring permanent employees, among male holders. The association is much less clear among female holders, shown in the right graph of the top left panel: there is no difference between holders aged 20–39 and holders aged 40–59, and only a small difference for holders aged 60 and over. The proportion of holdings that have employees is very small, regardless of the age or sex of the holders.

¹¹ There is no special reason why the percentages for males and females add up to 100%: it is a statistical coincidence.

Figure 1. Use of hired labour, by age and sex of holder



The top-right panel shows the number of permanent employees that the holding hires, given that they hire any. There is no clear evidence of an association between age of holder and number of employees.

Hiring of temporary employees is much more common than hiring of permanent employees. Neither the full sample nor the sub-sample provides evidence of an age or sex difference in the propensity to hire temporary employees.

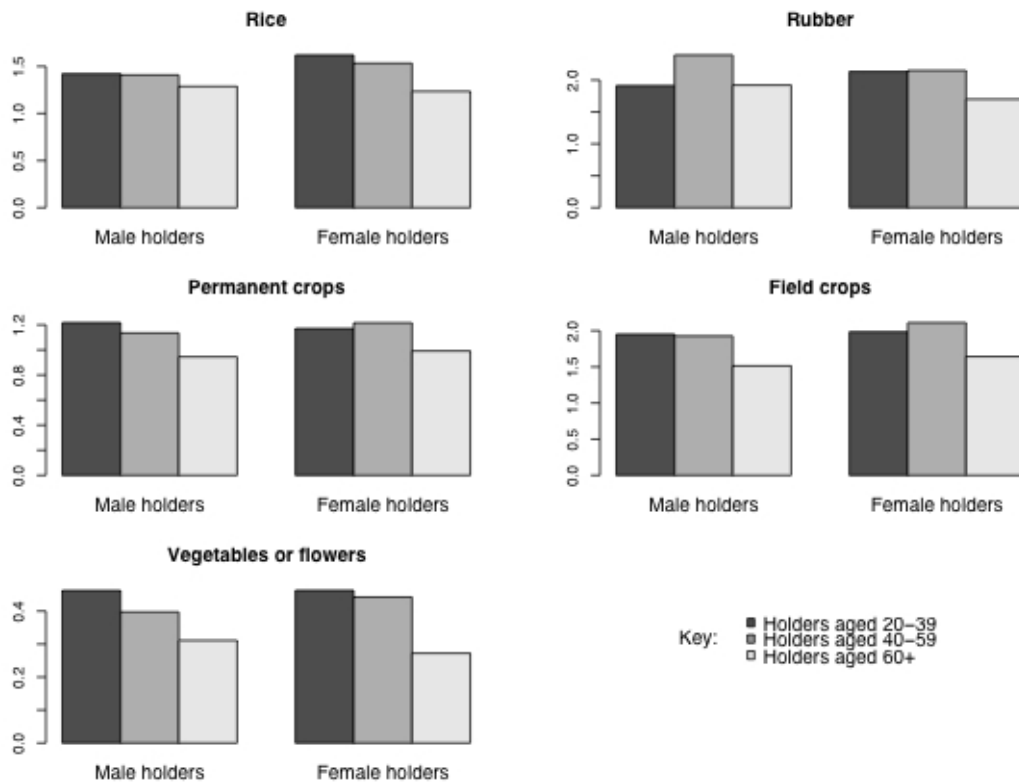
An alternative to hiring employees is to lease land to sharecroppers. This may be an attractive option for old people who are physically unable to farm the land themselves. Unfortunately, the Agricultural Census data do not allow us to test whether leasing land is more common for old people than for young people. Under the definitions used, a sharecropper's would belong to a different holding from the old person who was leasing the land, and there is no way to link the two.

4.3 Use of land

The census contains data on land used (as opposed to owned) by each holding. Analysis of these data shows that land use per holding varies little by the age or sex of the holder. As indicated in Table 14, however, holdings run by older people have more workers. This suggests that land use per worker declines with the age of the holder.

Figure 2 gives detailed results. The estimates are stratified by type of crop: results for each crop refer only to holdings that grow that crop. The negative association between land use per worker and age of the holder is particularly clear in the case of vegetables and flowers. One possible explanation for the general negative association is that elderly holders are physically incapable to work the same size plots as young holders. We are not sure why the association would be stronger for vegetables and flowers.

Figure 2. Hectares per household worker, by age and sex of holder



Source: Authors' calculations based on the 2003 Agricultural Census.

Note: A 'household worker' is a member of the household who works on the holding. Part-time workers count as 0.25 or 0.75 of a full-time worker; see the text for details.

Holdings in all regions of Thailand own the majority of land that they use. As can be seen in Table 15, ownership rates are lowest in central Thailand, where the countryside is most commercialized and land most expensive (Molle and Srijantr 2003), and highest in southern Thailand. Ownership rates rise with the age of the holder. As mentioned above, this is consistent with a household lifecycle in which young people eventually inherit land from their parents. Admittedly, there are other possible explanations. Perhaps young farmers are more willing to bear the risks involved in renting land, or perhaps old farmers are discriminated against in the rental market. But there seems to be little justification for invoking these explanations when most or all of the measured variation could plausibly be attributed to the household life cycle.

Table 15. Percent of land used by the holding that is owned by the holding, by region, and by age and sex of holder

Region	Males			Females		
	20–39	40–59	60+	20–39	40–59	60+
Central	56	62	73	65	71	80
North	64	71	84	66	77	84
Northeast	79	85	92	81	86	92
South	93	94	96	90	95	97
Whole country	74	79	87	77	82	89

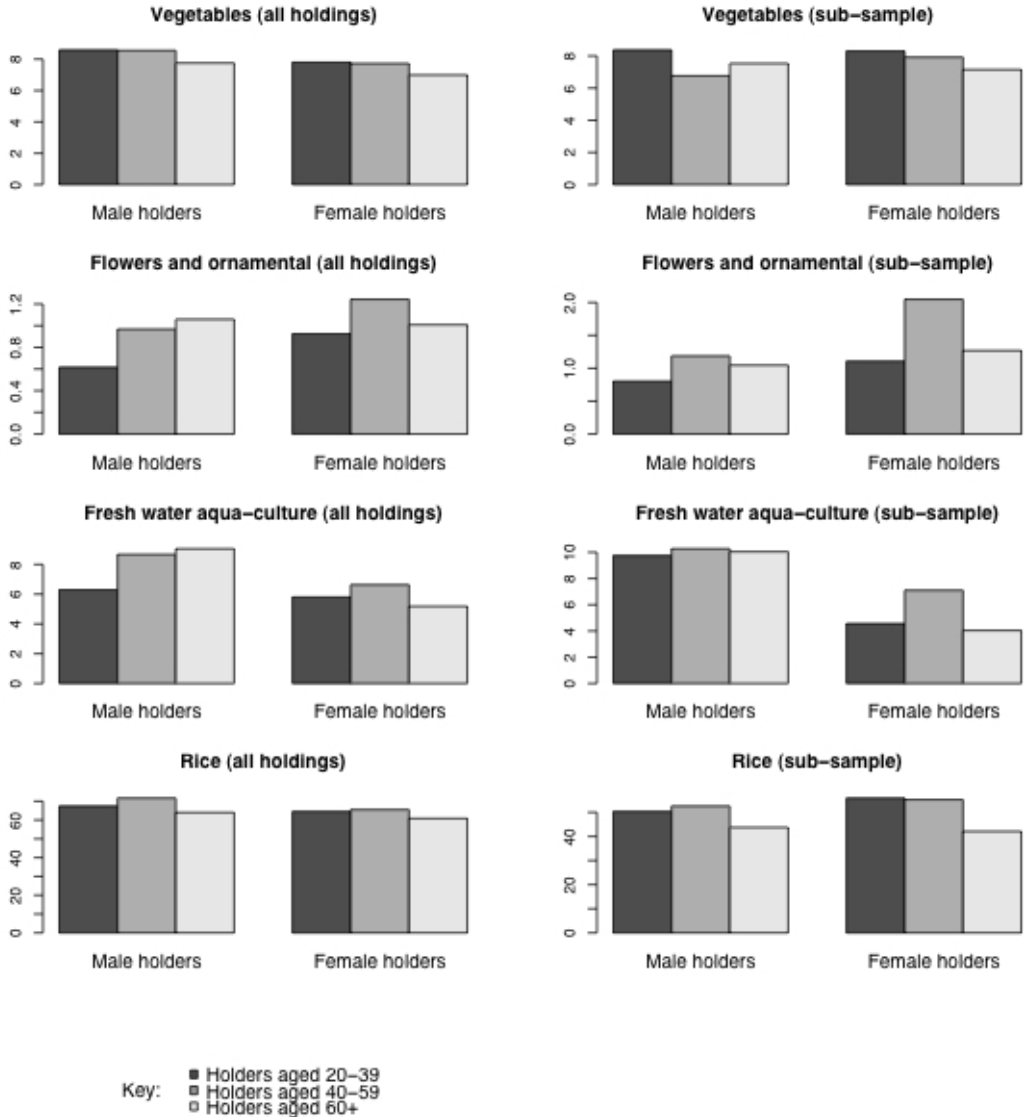
Source: Authors' calculations based on the 2003 Agricultural Census.

The gender difference apparent in Table 15 is intriguing. Holdings headed by females own more of the land that they use than holdings headed males, particularly in central Thailand. It does not seem to be possible to attribute the gender difference to lifecycle effects, and we are not sure what the explanation is.

4.4 Type of production

As discussed in Section 2.3, Thai farmers have been moving out of rice-growing, and into higher-value activities, such as vegetable-growing, flowers, and aquaculture. Figure 3 shows data on whether old farmers have been any faster or slower than young farmers to switch into the new activities. The results for the whole sample and the sub-sample are different, so both are shown.

Figure 3 Percent of holdings carrying out the indicated activities, by age and sex of holder



Source: Authors' calculations based on the 2003 Agricultural Census.

The results are mixed. There is a weak negative association between age of holder and likelihood of growing vegetables, but holders over 40 seem to be more likely to grow flowers than holders under 40. Aquaculture gives contradictory results. The full sample shows, for males, a positive relationship between age and involvement in aquaculture, while the sub-sample shows no relationship. Perhaps surprisingly, farms headed by old people seem to be slightly less likely to grow rice than farms headed by young people, particularly in the sub-sample.

We have carried out separate analyses for the Centre, North, Northeast, and South of Thailand (results not shown.) The findings were similar to that of Figure 3. The main exceptions were that involvement in aquaculture reduced sharply with age of holder in the Centre, but

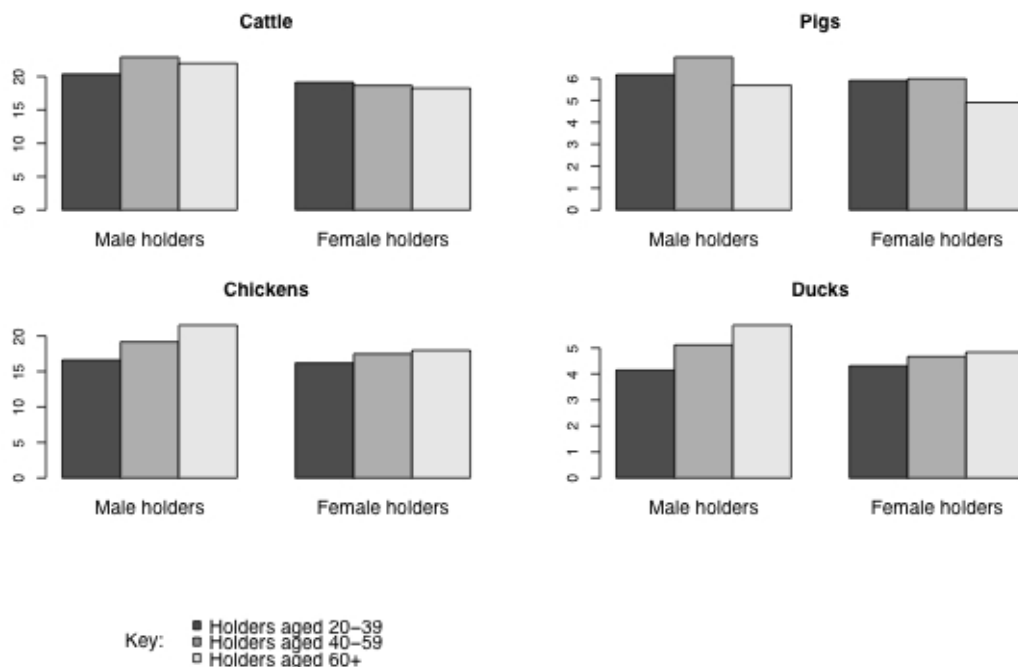
increased sharply in the Northeast. In the South, there was a pronounced tendency for rice growing to increase with age.

The national and regional results are somewhat variable and difficult to interpret. Overall, however, they provide no evidence for the idea that older farmers are slower to adopt new crops than young farmers.

The only consistent gender difference is that holdings headed by women are less likely to be involved in aquaculture than holdings headed by men. Aquaculture requires substantial capital and has highly variable returns (Molle and Srijantr 2003). Results on use of credit shown below indicate that holdings headed by women are less likely to have debts than holdings headed by men. We suspect that the results for credit and aquaculture have a common cause, though we do not know whether the common cause is gender differentials in willingness to take on risks, discrimination in credit markets, or something else.

Figure 4 shows data on the raising of animals. There is no clear age pattern for cattle, but holders aged 60 and over are less likely than younger holders to raise pigs. There is a strong association between age and the raising of poultry, perhaps because poultry farming is less physically demanding. Data on numbers of animals raised (not shown) reveal no clear association between age of holder and number of animals. The fact that old people are disproportionately likely to raise poultry means that they are disproportionately affected by measures to control avian influenza. It should, nevertheless, be recognized that the relatively small size of the older age group means that old people still constitute a minority of poultry farmers.

Figure 4 Percent of holdings raising animals, by age and sex of holder



Source: Authors' calculations based on the 2003 Agricultural Census.

4.5 Orientation to the market

Siamwalla (2004) has suggested that a split may be developing between young, market-conscious farmers and older subsistence farmers, with the older farmers relying on remittances from children to supplement their agricultural incomes. Comparisons of holdings can be used to test both parts of this hypothesis.

Figure 5 shows responses to the question of why the holding grows rice. The results for the full sample suggest that, if anything, old people are marginally more likely to grow rice for sale only than young people, though the results for the sub-sample (not shown) indicate no systematic relationship. A similar question on reasons for carrying out aquaculture yielded no relationship between age and likelihood of undertaking aquaculture for sale. Comparison of holdings headed by young and old therefore provide no support for the hypothesis that the old are disproportionately likely to be subsistence farmers.

Figure 5 Percent holdings growing rice for the indicated purpose, by age and sex of holder

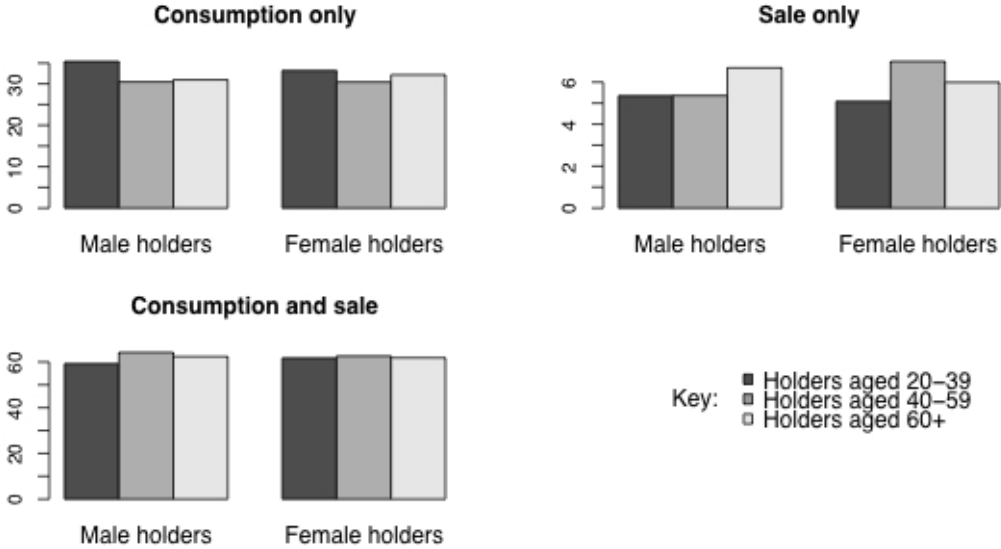


Source: Authors' calculations based on data from the 2003 Agricultural Census

As Figure 6 shows, however, the second part of Siamwalla's hypothesis is supported by the agricultural census data. There is a tendency, particularly in the sub-sample, for holdings headed by older people to receive more of their income from non-agricultural sources. The census does not provide any information on the nature of the non-agricultural income, but it is likely that, for older holders, at least some of this income consists of remittances and non-agricultural wages from children.

Holdings headed by women are slightly more likely than holdings headed by men to rely on non-agricultural income. Results shown below in Section 4.8 indicate that women receive less agricultural income than men. Presumably non-agricultural income such as remittances partly compensates.

Figure 6 Percent of holdings receiving income from the indicated source, by age and sex of holder



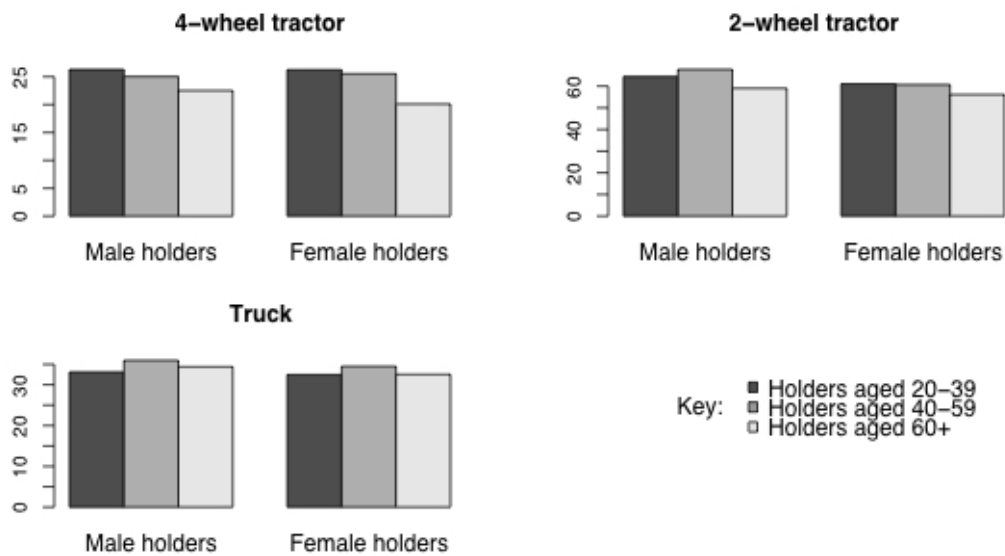
Source: Authors' calculations based on data from the 2003 Agricultural Census.

4.6 Use of technology

There has been a big increase in the use of capital and chemical inputs in Thailand since the 1980s (Section 2.3). The Census contains data on three components of this trend: machinery, fertilizer, and pesticide. Figure 7 presents data on mechanization. Farms headed by young people are more likely to use two-wheeled and four-wheeled tractors than farms headed by old people; the association is somewhat stronger in the sub-sample than in the full-sample results shown here. There appears to be no age difference in use of trucks. The Census also contains data on the source of the machinery (not shown). Holdings headed by old people who used a two-wheeled tractor were just as likely to own a tractor as holdings headed by young people.

There is no clear gender difference in machinery use. There is, however, a difference in ownership: 60% of holdings headed by males, but only 40% of holdings headed by females, owned their tractors. In most cases, holdings that did not own their own tractors borrowed them from an agricultural service.

Figure 7 Percent of holdings using machinery, by age and sex of holder



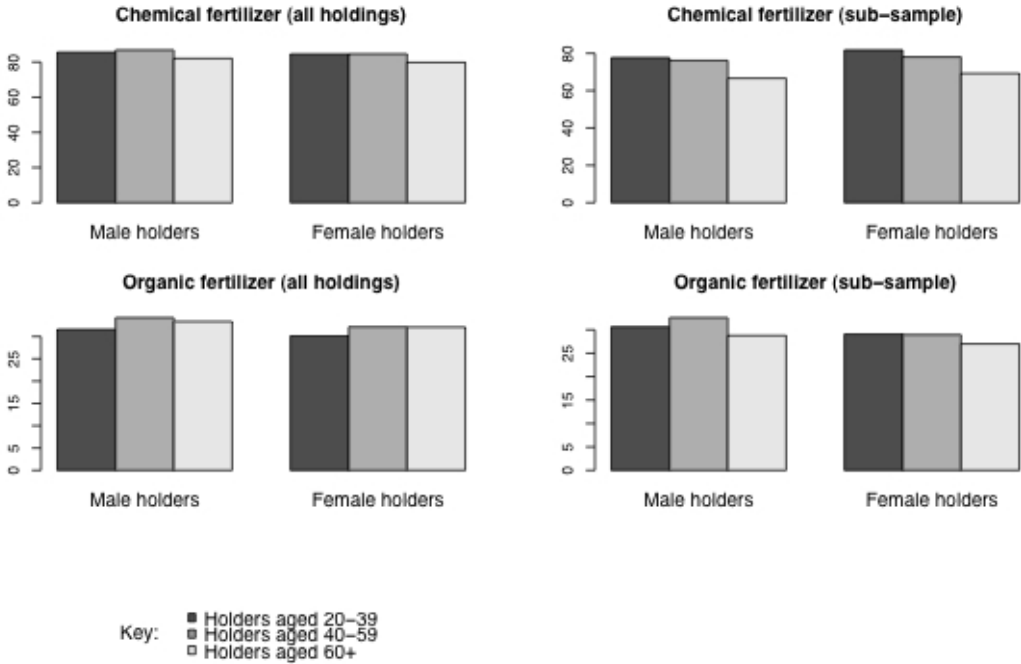
Source: Authors' calculations based on data from the 2003 Agricultural Census.

Figure 8 shows data on fertilizer use. The results differ by sample. In the full sample, holdings headed by people over 60 are slightly less likely than holdings headed by people under 60 to use chemical fertilizer; in the sub-sample, the difference is more pronounced. In the full sample, there is no relationship between age of the holder and use of organic fertilizer; in the sub-sample, holdings headed by old people are slightly less likely to use it. The finding of slightly lower organic fertilizer use among old people is perhaps contrary to expectations, as old people might be considered more likely to use a 'traditional' method.

An analysis for a specific crop – rice – revealed no association between age and use of fertilizer. The rice data also showed that there was no age difference in the quantity of fertilizer applied, among those who applied any.

The relatively small age differentials may, to some extent, reflect the intensive promotional activities by fertilizer manufacturers. Fertilizers are widely advertised on television (early in the morning), and salespeople are found throughout rural Thailand. Information on fertilizers is therefore readily available, and all farmers, young and old, are subject to promotional campaigns.

Figure 8 Percent of holdings using fertilizer, by age and sex of holder

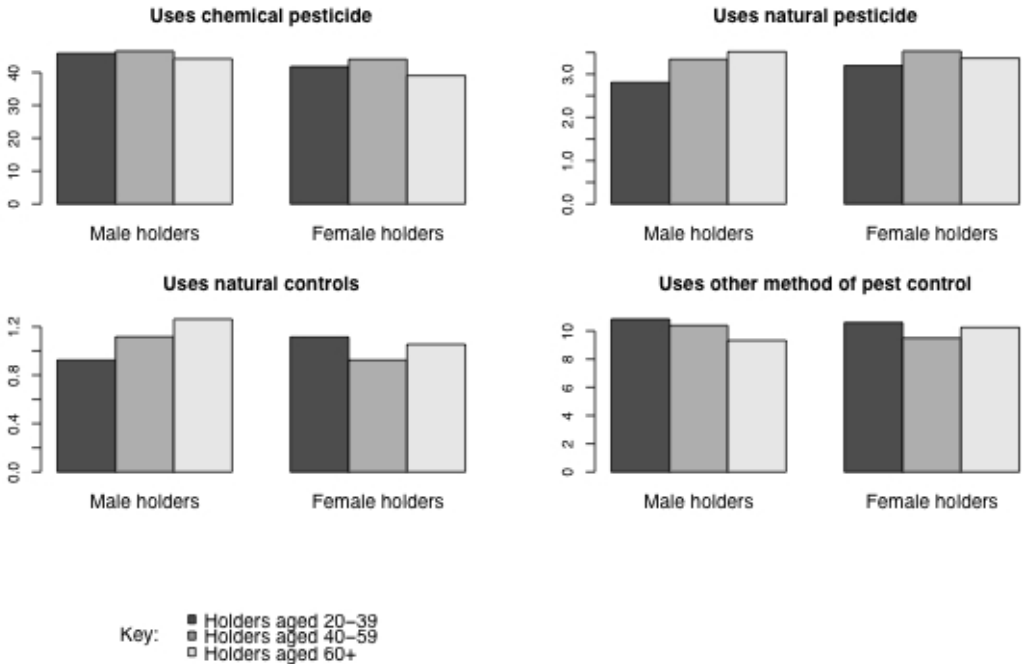


Source: Authors' calculations based on data from the 2003 Agricultural Census.

Analysis of the data on methods of pest control (Figure 9) shows holdings headed by people over 60 to be slightly less likely to use chemical pesticides than holdings headed by people under 60. There is a positive association between the age of the holder and the likelihood of using 'natural' method of pest control, but this relationship holds only for males, and use of natural methods is, in any case, rare in all age groups. Results for the sub-sample are much the same, so are not shown here.

As with fertilizer, the absence of a large age differential may partly reflect the promotional efforts of the manufacturers.

Figure 9 Percent of holdings using the indicated method of pest control, by age and sex of holder



Source: Authors' calculations based on data from the 2003 Agricultural Census.

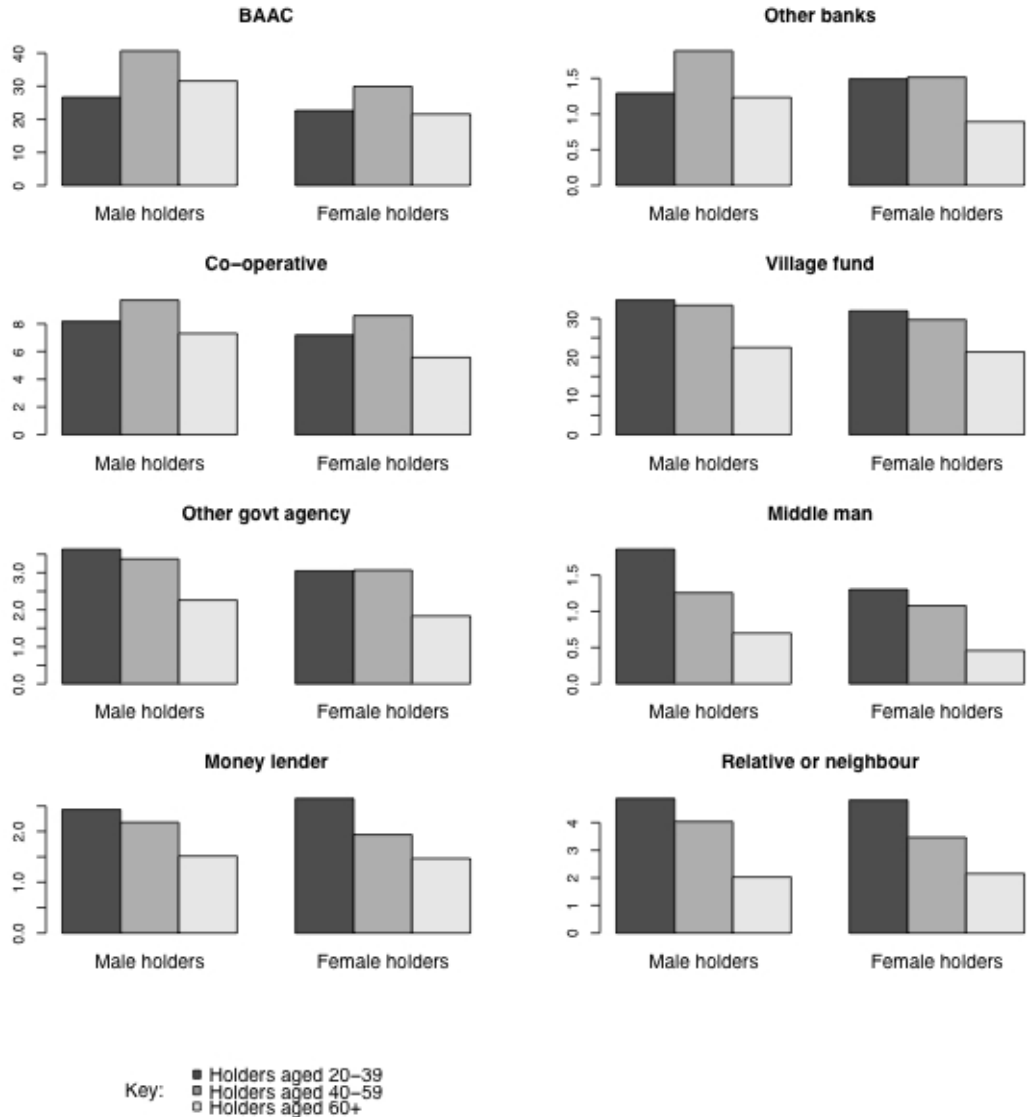
4.7 Use of credit market

The use of credit markets (Figure 10) shows a clear age pattern. Holdings headed by old people are much less likely to have debts than holdings headed by young people. The only exception, curiously, is the Bank of Agriculture and Agricultural Cooperatives (BAAC). This is an important exception, however, as the BAAC, together with village funds established by the government in 2001, are the major sources of rural credit. The sums borrowed from the village funds are typically small, as villages were granted a total of one million baht each to use for the funds. For most sources of credit, holdings headed by women are less likely to have debts than holdings headed by men.

Analyses of amounts borrowed and (for middlemen, money lenders, and friends and relatives) interest rates showed no difference by age or gender.

Non-economists tend to see an absence of debt as evidence of virtue or income sufficiency. Economists tend to wonder about risk aversion, access to collateral, discrimination in the credit market, and life cycle effects. We have no direct evidence on which, if any, of these factors is relevant here. Life cycle effects are, however, likely to be important. Younger holders who have recently established their own farms or who are waiting to inherit land presumably have more need to borrow.

Figure 10 Per cent of holdings having debts from the indicated sources, by age and sex of holder



Note: The BAAC is the Bank for Agriculture and Agricultural Cooperatives, a government-owned bank serving farmers. Source: Authors' calculations based on data from the 2003 Agricultural Census.

4.8 Income

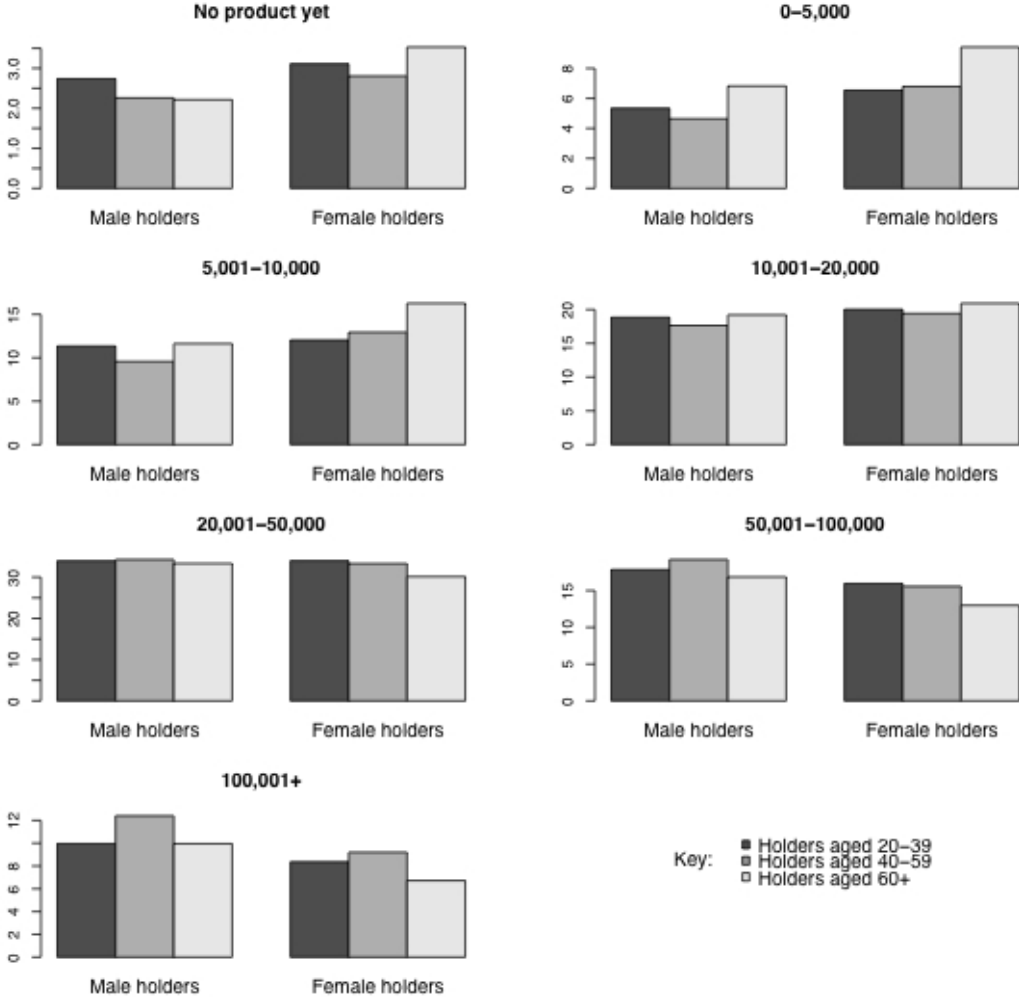
The final comparison concerns income from agriculture. Estimates of income are highly error-prone, as survey respondents often do not like answering income questions, or find them difficult. Such questions do, nevertheless, provide some indication of poverty levels and production volumes.

Figure 11 indicates that holdings headed by older people and by women are disproportionately likely to belong to low-income categories. This is consistent with the

results from Section 4.5, showing that holdings headed by older people and women were more likely to rely on non-agricultural income.

The negative relationship between age and income is stronger in the sub-sample (not shown.)

Figure 11 Value of agricultural production from the previous year (Thai baht), by age and sex of holder



Source: Authors' calculations based on data from the 2003 Agricultural Census.

5 Discussion

5.1 Summary of results

The working-age populations of rural and urban Thailand are ageing at the same rate, with rural-urban migration by the young offsetting the effects of rural Thailand's higher fertility and mortality. Young people in rural areas are, however, seeking employment in industries other than agriculture, to the point where agriculture now has the oldest workforce of any

sector in Thailand. Movement to the cities and out of agriculture has been more pronounced for young women than for young men.

In Thailand, older cohorts have considerably less formal education than younger cohorts. This – combined with possible differences in experience, physical ability, preferences, and income – might be expected to show up in differences between farms headed by old people and young people. We tested for such differences using data from the 2003 Agricultural Census. Table 16 summarizes the results.

Table 16. Differences between farms headed by old people and farms headed by young people

Comparison	Age differences	Gender differences
Labour		
Household members working on holding	Holdings headed by old people have more workers than holdings headed by young people*	Holdings headed by women have fewer workers than holdings headed by men
Proportion hiring permanent employees	Slightly higher for old people; but rare in all age groups. No difference in numbers hired	No difference
Proportion hiring temporary employees	No difference	No difference
Land		
Area used by holding	No difference in area per <i>holding</i> ; but holdings headed by old people use less land per <i>worker</i>	No difference
Percent of area used by holding that is owned by holding	Higher for holdings headed by old people*	Higher for holdings headed by women
Type of production		
Crops, activities	On balance, no evidence for age difference in propensity to shift from rice into 'new' crops or activities. Old people more likely to be involved in poultry farming	No difference, except that households headed by women less likely to be involved in aquaculture
Orientation to market		
Production for consumption or sale	No difference	No difference
Importance of non-agricultural income	Holdings headed by old people more likely to rely on non-agricultural income (including remittances)	Holdings headed by women more likely to rely on non-agricultural income
Use of technology		
Use of machinery	Holdings headed by old people less likely to use tractors; no difference for trucks	No difference
Ownership of 2-wheel tractor	No difference	Holdings headed by females less likely to own the tractor that they use
Use of fertilizer	Holdings headed by old people slightly less likely to use chemical or organic fertilizer	No difference

Comparison	Age differences	Gender differences
Use of pesticides	Holdings headed by old people slightly less likely to use chemical pesticides	No difference
Use of credit		
Proportion of holdings with debts	Holdings headed by old people less likely to have debts*, except for debts from BAAC**	Holdings headed by women less likely to have debts
Amounts borrowed; interest rates	No difference	No difference
Income from agriculture		
	Holdings headed by old people more likely to belong to low-income categories	Holdings headed by women more likely to belong to low-income categories

*Some or all of the observed difference is probably due to the household lifecycle.

**The government-owned Bank of Agriculture and Agricultural Cooperatives.

Farms headed by older people have more household workers than farms headed by younger people, own more of the land they farm, and have fewer debts. All three differences are consistent with a household lifecycle in which people accumulate assets and then transfer them to a co-resident child when old.

Farms headed by older people are just as likely as farms headed by young people to produce for the market, or to move out of rice into new activities such as flower-growing, vegetable-growing, and aquaculture. Farms headed by older people are less likely to use fertilizer, machinery, and chemical pesticides: however, these differences are fairly muted.

Farms headed by older people are more likely than farms headed by younger people to produce relatively low volumes, and to depend on income sources other than agricultural production. This is particularly true if the head is a woman.

5.2 Implications

Will rural ageing retard the transformation of Thai agriculture?

The ageing of the agricultural workforce will only affect mechanization, technological diffusion, crop choice, commercialization, and aggregate output to the extent that old farmers differ from young farmers. If farms headed by old people had exactly the same output, for instance, as farms headed by young people, then a change in the ratio of old heads to young heads would have no effect at all on aggregate output. As Table 16 shows, old farmers do in fact differ from young farmers. However, the differences are relatively muted. This implies that ageing may have less effect on mechanization, technological diffusion, crop choice, commercialization, and output than might be feared.

This conclusion requires some caveats. As discussed in Section 4.1, comparisons between holders understate differences between young farmers and old farmers to the extent that holders share authority with others in the household. While the similarity between the full-sample and sub-sample results suggests that the resulting bias is not large, it will lead to some understatement of the age differentials.

Another caveat is that differentials between young farmers and old farmers are affected by the selection process that determines who farms. We suspect that, on balance, there is positive selection of old people into farming, since only healthy people can continue to farm. Reported health status, shown in Table 4, provides (weak) confirmation of this suspicion. It is also possible, however, that successful farmers are more likely to retire after they reach 60 years of age. Positive selection is probably one reason why the differentials between old and young farmers are relatively small. If the selection process were to change, then the age differentials would alter accordingly. For instance, if successful farmers began to retire earlier (perhaps influenced by urban expectations about retirement), then the differentials would widen.

It is also important to bear in mind that agricultural development in Thailand has, in some ways, been disappointing. As discussed in Section 2.3, output per worker in agriculture is similar to that of the Philippines or Indonesia, despite the fact that output per worker across the whole economy is much higher in Thailand. To say that holdings headed by old people have almost the same output as holdings headed by young people does not imply that either have particularly high output.

Poverty and vulnerability

Neither the Labour Force Surveys nor the Agricultural Census is well suited to assessing poverty or food security. Neither source contains information on expenditures, for instance, or food intake. Moreover, the Agricultural Census, by design, excludes people who are unable or unwilling to continue farming.

The results from the Agricultural Census do, nevertheless, suggest one conclusion that is important for understanding poverty and vulnerability among old people in rural Thailand. The results suggest that a significant minority of people continue to successfully farm into old age. The old people who continue farming adopt new crops and technologies as quickly, or almost as quickly, as young people. These old people provide their own income and food security.

Rural old people who are not active in agriculture are a heterogeneous group, including, for instance, wealthy retired officials and business people, but also impoverished ex-farmers who were forced to stop working because of ill health. It is important to note, however, that all old people, farmers or not, are eligible for government health insurance of some form. This provides protection against a major threat to the financial security of old people. Moreover, most evidence suggests that traditional systems of old-age support are still more-or-less intact, and that elderly Thais can still depend on their children for assistance with living costs and daily activities. The current system of family support will, however, be put under increasing strain by ongoing demographic changes. As discussed in Section 2.1, the proportion of Thai old people with only one child or no children is set to increase substantially over the coming decades.

Recommendations for further research

Use of agricultural censuses to study population ageing is still relatively rare in developing countries (Stloukal 2000). The Thai Agricultural Census has some important limitations as an information source on rural elderly: it does not cover all rural elderly, and it lacks measures of

health, nutrition, and expenditure. However, it has compensating advantages, such as detailed information on farm assets and activities, and a large sample size. Our study has certainly not exhausted the analytical possibilities. It might be worthwhile, for instance, to study old people's involvement in particular well-defined activities such as chicken farming or rice growing. It might also be worthwhile to use two or more censuses to study changes over time. If it were possible to identify the same districts in two different censuses, then district-level changes in crop patterns or capital intensity could be compared with district-level changes in age structure. This would provide a rigorous test of the effects of ageing on agricultural development. Ideally, further qualitative studies would be complemented by qualitative ones that sought old people's views on the opportunities and constraints they face.

Our analysis has uncovered some interesting gender differences. For instance, Thai women are more likely to own the land that they farm than men, and are less likely to have debts. These differences warrant further investigation, though it would probably be necessary to use sources other than the Agricultural Census.

As noted in Section 2, Thailand's rural economy and society are unusual in a number of ways. The ratio of land to people is high by Asian standards. Thailand's urban economy has been one of the fastest-growing in the world, which has drawn large numbers of talented young people off the land. Thailand's kinship system gives a large role to women, and women have traditionally had substantial control over land. These unusual features have presumably helped shape age and gender differentials in matters such as mechanization and crop choice. Care therefore needs to be taken when extrapolating our findings to other countries. Similar studies are needed to identify commonalities and differences.

Policy implications

Large changes are occurring to the age structure of Thailand's rural population and agricultural workforce, and even larger ones can be expected in future. The analysis presented in this report suggests that the effect on agricultural production has so far been fairly small. However, it is not difficult to think of problems that might arise in the future. A substantial decline in numbers of living children could, for instance, put some family farms at risk, if younger family workers proved to be indispensable for some activities. It is therefore important to continue monitoring the effect of ageing on agriculture. Because Thailand already collects substantial statistical information on rural areas, the monitoring can be done relatively easily.

Rapid ageing of the agricultural workforce might appear to reduce the returns to investments in agricultural extension, on the grounds that old farmers are less likely than young farmers to adopt new technologies or crops. However, the results presented in this report provide no support for such views. Instead, the results suggest that old farmers adopt new technologies or crops as fast, or almost as fast, as young farmers. The ageing of the agricultural workforce would not warrant any reduction in efforts to improve agricultural extension in Thailand.

The results presented in this report also have implications for interventions to assist older farmers. It would be easy to assume that older people are not willing or able to adopt the farming practices of younger people. While this assumption may be true for some individuals and some activities, age differences should not be overstated. It may therefore be more cost

effective to make sure that older people are included in ordinary extension, credit, or training programs than to construct special programs for them.

Acknowledgements

The National Statistical Office, Thailand, provided the data for this project, and promptly answered all our questions. Libor Stoukal and other FAO officers, and colleagues at the Institute of Population and Social Research provided many helpful comments on earlier versions of this report.

References

- Bryant, J. (2005). Projecting numbers of living children of old people, with examples from Korea and Thailand. *Riding the Age Waves: Population, Resources and Development*. S. Tuljapurkar, I. Pool and V. Prachubmoah. Dordrecht, Kluwer/Springer.
- Coxhead, I. and J. Plangraphan (1998). "Thailand's Economic Boom and Bust, and the Fate of Agriculture." *TDRI Quarterly Review* 13(2): 15-24.
- Foster, B. L. (1975). "Continuity and change in rural Thai family structure." *Journal of Anthropological Research* 31(1): 34-50.
- Gray, R. (1999). *The Effects of Globalization on Labour Force and Migration in Thailand. The Impact of Globalization on Population Change and Poverty in Rural Areas*. United Nations Economic and Social Commission for Asia and the Pacific. New York, United Nations: 33-48.
- Gray, R. (2004). *Inter-generation Relations and Living Arrangement of the Elderly in Thailand*. Nakhon Pathom, Institute for Population and Social Research, Mahidol University.
- Kemp, J. H. (1982). "Kinship and locality in Hua Kok." *Journal of the Siam Society* 70(1): 101-13.
- Keyes, C. F. (1975). *Kin groups in a Thai-Lao community. Change and Persistence in Thai Society: Essays in Honor of Lauriston Sharp*. G. W. Skinner and A. T. Kirsch. Ithaca, Cornell University Press.
- Knodel, J., N. Chayovan, et al. (2005). *Thailand's Older Population: Social and Economic Support as Assessed in 2002*. Ann Arbor, Population Studies Center.
- Mizuno, K. (1968). "Multihousehold compounds in northeast Thailand." *Asian Survey* 8(19): 842-52.
- Molle, F. and T. Srijantr (2003). *Socio-economic and environmental implications of inland shrimp farming in the Chao Phraya Delta. Thailand's Rice Bowl: Perspectives on Agricultural and Social Change in the Chao Phraya Delta*. B. W. Szuster, F. Molle, M. Flaherty and T. Srijantr. Bangkok, White Lotus.

- Molle, F. and T. Srijantr, Eds. (2003). Thailand's Rice Bowl: Perspectives on Agricultural and Social Change in the Chao Phraya Delta. Studies in Contemporary Thailand. Bangkok, White Lotus.
- National Statistical Office (No date). 2003 Agricultural Census: Central Region. Bangkok, National Statistical Office, Ministry of Information and Communication Technology.
- Potter, J. M. (1976). Thai Peasant Social Structure. Chicago, University of Chicago Press.
- Potter, S. H. (1977). Family life in a Northern Thai Village. Berkeley, University of California Press.
- Sharp, L. and L. M. Hanks (1978). Bang Chan: Social History of a Rural Community in Thailand. Ithaca, Cornell University Press.
- Siamwalla, A. (1991). Land-abundant agricultural growth and some of its consequences: The case of Thailand. Bangkok, TDRI.
- Siamwalla, A. (2004). The Ageing of Thai Agriculture: Past and Present Prospects of the Rural Scene. 2004 Technical Seminar, Bangkok, Ministry of Resources and Environment and the Thailand Development Research Institute.
- Sirisup, S. and H. D. Kammeier (2003). Government policy and farmers' decision-making: The agricultural diversification programme for the Chao Phraya River Basin (1993-95) revisited. Thailand's Rice Bowl: Perspectives on Agricultural and Social Change in the Chao Phraya Delta. B. W. Szuster, F. Molle, M. Flaherty and T. Srijantr. Bangkok, White Lotus.
- Skeldon, R. (1997). Migration and Development: A Global Perspective. Harlow, Longman.
- Stloukal, L. (2000). What can agricultural censuses tell us about rural population ageing in developing countries? Rome, FAO. <http://www.fao.org/sd/wpdirect/wpan0051.htm>
- Stloukal, L. (2004). Rural population ageing in developing countries: issues for consideration by FAO. Rome, FAO. http://www.fao.org/sd/dim_pe3/pe3_040401_en.htm
- Wachter, K. and J. Knodel (2003). "Parental bereavement: Heterogeneous impacts of AIDS in Thailand." *Journal of Econometrics* 112: 193-206.
- Yanu, T. (1968). "Land tenure in Thailand." *Asian Survey* 8(10): 853-63.

Appendix – Data used in figures

Appendix Table 1. Data from Figure 1 Use of hired labour by age and sex of holder

	Males			Females		
	15–39	40–59	60+	15–39	40–59	60+
<i>All holdings</i>						
Percent using permanent employees	2.2	3.0	3.9	3.1	3.1	3.5
Number of permanent employees, if used	4.2	3.9	3.7	4.6	3.6	4.0
Percent using temporary employees	55.1	59.9	55.7	54.2	56.9	52.4
<i>Sub-sample</i>						
Percent using permanent employees	5.5	6.1	7.1	4.1	4.1	5.4
Number of permanent employees, if used	3.3	3.6	3.2	3.4	2.6	1.8
Percent using temporary employees	50.3	52.8	45.2	51.3	51.1	45.6

Appendix Table 2. Data from Figure 2 Hectares per household worker, by age and sex of holder (all holdings)

	Males			Females		
	15–39	40–59	60+	15–39	40–59	60+
Rice	1.42	1.41	1.29	1.62	1.53	1.23
Rubber	1.91	2.39	1.92	2.13	2.15	1.70
Permanent crops	1.22	1.14	0.95	1.17	1.22	0.99
Field crops	1.95	1.93	1.51	1.98	2.11	1.64

Appendix Table 3. Data from Figure 3 Percent of holdings carrying out the indicated activities, by age and sex of holder

	Males			Females		
	15-39	40-59	60+	15-39	40-59	60+
<i>All holdings</i>						
Vegetables	8.6	8.6	7.8	7.8	7.7	7.0
Flowers and ornamental	0.6	1.0	1.1	0.9	1.2	1.0
Fresh water aqua-culture	6.3	8.7	9.1	5.8	6.6	5.2
Rice	67.4	71.6	64.0	64.5	65.5	60.8
<i>Sub-sample</i>						
Vegetables	8.4	6.8	7.5	8.3	7.9	7.2
Flowers and ornamental	0.8	1.2	1.0	1.1	2.0	1.3
Fresh water aqua-culture	9.7	10.3	10.0	4.6	7.1	4.0
Rice	50.3	52.6	43.7	55.9	55.2	42.1

Appendix Table 4. Data from Figure 4 Percent of holdings raising animals, by age and sex of holder

	Males			Females		
	15-39	40-59	60+	15-39	40-59	60+
<i>All holdings</i>						
Cattle	20.4	22.9	22.0	19.1	18.7	18.2
Pigs	6.2	7.0	5.7	5.9	6.0	4.9
Chickens	16.6	19.2	21.5	16.2	17.5	18.0
Ducks	4.1	5.1	5.9	4.3	4.7	4.8
<i>Sub-sample</i>						
Cattle	15.9	16.3	14.5	15.2	12.6	10.7
Pigs	5.5	5.9	5.0	5.0	6.7	4.6
Chickens	15.5	17.3	22.6	12.7	14.5	14.8
Ducks	3.7	4.7	4.9	2.9	2.7	3.2

Appendix Table 5. Data from Figure 5 Percent of holdings growing rice for the indicated purpose, by age and sex of holder

	Males			Females		
	15-39	40-59	60+	15-39	40-59	60+
<i>All holdings</i>						
Consumption only	35.4	30.5	31.0	33.2	30.4	32.2
Sale only	5.4	5.4	6.7	5.1	7.0	6.0
Consumption and sale	59.2	64.2	62.3	61.7	62.6	61.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
<i>Sub-sample</i>						
Consumption only	32.8	34.4	34.0	40.1	31.9	40.0
Sale only	11.4	10.3	12.4	5.2	10.9	6.8
Consumption and sale	55.8	55.3	53.6	54.7	57.2	53.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

Appendix Table 6. Data from Figure 6 Sources of holding income, by age and sex of holder

	Males			Females		
	15-39	40-59	60+	15-39	40-59	60+
<i>All holdings</i>						
Agriculture only	22.1	19.3	22.5	22.5	20.8	21.8
Mainly agriculture	46.1	45.7	43.6	41.5	42.3	39.3
Equally agricultural and non-agr.	11.8	13.4	11.7	12.7	12.8	12.0
Mainly non-agricultural	19.9	21.6	22.2	23.3	24.0	26.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
<i>Sub-sample</i>						
Agriculture only	35.1	32.2	28.7	35.1	34.0	29.9
Mainly agriculture	31.2	29.9	27.0	26.3	28.3	23.9
Equally agricultural and non-agr.	11.7	12.0	9.7	15.1	11.5	10.8
Mainly non-agricultural	22.0	25.9	34.6	23.5	26.3	35.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

Appendix Table 7. Data from Figure 7 Percent of holdings using machinery, by age and sex of holder

	Males			Females		
	15-39	40-59	60+	15-39	40-59	60+
<i>All holdings</i>						
4-wheel tractor	26.3	25.0	22.5	26.3	25.5	20.1
2-wheel tractor	64.4	67.7	59.0	61.0	60.7	56.1
Truck	33.1	36.0	34.4	32.5	34.5	32.5
<i>Sub-sample</i>						
4-wheel tractor	23.5	22.9	18.1	25.0	24.0	20.4
2-wheel tractor	46.6	47.9	38.2	53.7	49.5	36.8
Truck	32.5	35.7	31.7	31.3	30.9	28.0

Appendix Table 8. Data from Figure 8 Percent of holdings using fertilizer, by age and sex of holder

	Males			Females		
	15-39	40-59	60+	15-39	40-59	60+
<i>All holdings</i>						
Chemical fertilizer	85.6	86.9	82.1	84.5	84.6	79.8
Organic fertilizer	31.6	34.2	33.3	30.1	32.1	32.1
<i>Sub-sample</i>						
Chemical fertilizer	77.6	76.1	66.6	81.7	78.0	69.2
Organic fertilizer	30.6	32.6	28.8	29.0	28.9	27.0

Appendix Table 9. Data from Figure 9 Percent of holdings using machinery, by age and sex of holder

	Males			Females		
	15-39	40-59	60+	15-39	40-59	60+
<i>All holdings</i>						
Uses chemical pesticide	45.8	46.5	44.2	41.8	44.0	39.1
Uses natural pesticide	2.8	3.3	3.5	3.2	3.5	3.4
Uses natural controls	0.9	1.1	1.3	1.1	0.9	1.1
Uses other method of pest control	10.8	10.4	9.3	10.6	9.5	10.2
<i>Sub-sample</i>						
Uses chemical pesticide	48.2	46.4	40.4	39.8	44.8	35.1
Uses natural pesticide	3.3	4.3	4.0	3.7	3.1	2.3
Uses natural controls	0.3	1.2	0.5	0.6	0.7	1.0
Uses other method of pest control	7.0	6.1	6.4	8.0	7.4	9.3

Appendix Table 10. Data from Figure 10 Percent of holdings having debts from the indicated sources, by age and sex of holder

	Males			Females		
	15-39	40-59	60+	15-39	40-59	60+
<i>All holdings</i>						
BAAC	26.7	40.7	31.6	22.6	29.9	21.6
Other banks	1.3	1.9	1.2	1.5	1.5	0.9
Co-operative	8.2	9.7	7.3	7.2	8.6	5.6
Village fund	34.7	33.4	22.5	31.9	29.7	21.3
Other govt agency	3.6	3.4	2.3	3.0	3.1	1.8
Middle man	1.9	1.3	0.7	1.3	1.1	0.5
Money lender	2.4	2.2	1.5	2.6	1.9	1.5
Relative or neighbour	4.9	4.0	2.0	4.8	3.5	2.2
<i>Sub-sample</i>						
BAAC	17.8	25.1	19.1	17.0	22.9	14.6
Other banks	1.5	2.0	1.0	1.2	1.6	0.5
Co-operative	5.8	6.0	7.0	5.0	6.9	2.8
Village fund	23.6	20.2	13.6	24.5	22.3	15.9
Other govt agency	2.5	1.8	1.7	2.5	2.3	1.0
Middle man	1.4	0.9	0.1	1.0	0.9	0.2
Money lender	1.9	1.4	1.0	1.5	1.3	1.2
Relative or neighbour	3.9	3.0	0.7	4.0	3.1	1.0

Appendix Table 11. Data from Figure 11 Value of agricultural product, by age and sex of holder

	Males			Females		
	15-39	40-59	60+	15-39	40-59	60+
<i>All holdings</i>						
No product yet	2.7	2.3	2.2	3.1	2.8	3.5
0-5,000	5.3	4.6	6.8	6.5	6.8	9.4
5,001-10,000	11.3	9.6	11.6	12.0	12.9	16.3
10,001-20,000	18.8	17.6	19.2	20.0	19.4	20.9
20,001-50,000	33.9	34.3	33.3	34.0	33.3	30.1
50,001-100,000	17.9	19.2	16.9	16.0	15.6	13.0
100,001+	10.0	12.4	10.0	8.4	9.2	6.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
<i>Sub-sample</i>						
No product yet	3.3	4.0	3.9	3.2	3.5	5.2
0-5,000	6.0	6.6	13.0	9.5	8.5	14.4
5,001-10,000	12.7	11.9	12.1	14.7	14.5	19.3
10,001-20,000	17.7	18.6	19.8	22.1	21.9	22.7
20,001-50,000	31.9	29.8	28.0	28.4	30.7	24.5
50,001-100,000	16.9	15.9	12.4	15.9	13.4	8.8
100,001+	11.6	13.2	10.8	6.2	7.6	5.2
Total	100.0	100.0	100.0	100.0	100.0	100.0