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**Trajectories of change and the role of aquatic
food production systems in household
livelihoods**

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1 Background

The objective of this report is to identify factors that may affect trajectories of change of Aquatic Food Production Systems (AFPS) in the peri-urban areas of Hanoi, HCMC, Phnom Penh, and Bangkok. AFPS is a livelihood practised by households around the peripheries of these major cities in mainland Southeast Asia. Such systems involve the farming or husbandry of several species of fish and aquatic plants as listed in Table 1. Fish seed production is also considered an AFPS activity.

English Common Name	Latin Name	Thai Common Name	Khmer Common Name	Vietnamese Common Name
Plants				
Morning glory, Kangkong, Chinese water spinach, water convolvulus, water spinach, swamp cabbage, swamp morning glory, and tropical spinach	<i>Ipomoea aquatica</i> Forsskal	Pak Bung	Trarkoun	Rau Muong
Salvinia	<i>Salvinia molesta</i>	Jookhunu		
Urticularia	<i>Urticularia sp.</i>			
Water cress	<i>Nasturtium officinale</i> R. Be	Watercress		Xa lach son
Water dropwort	<i>Oenanthe javanica</i> (Blume) DC.	Pak chelom	Kro outchhouk	
Water hyacinth	<i>Eichhornia crassipes</i>	Topchawa	Komplork	Luc binh
Water lettuce	<i>Pistia stratiotes</i>	Jook	Chork thom	Rau diep
Water lily	<i>Nymphaea lotus</i>	Bua sai	Prolit	Sung
Water lotus	<i>Nelumbo nucifera</i> Gaertn	Bualuang	Chhouk	Sen
Water mimosa	<i>Neptunia oleracea</i> Lour.	Khachad	Kanchheet	Rau Nhut
Fish				
Bighead carp	<i>Aristichthys nobilis</i>	Lin	Trey carb kbal thom	Me Hoa
Black carp	<i>Mylopharyngodon piceus</i>		Trey carb khmao	Me den
Climbing perch	<i>Anabas testudineus</i>	Pla Mhor	Trey kranh	
Colosoma	<i>Colosoma sp.</i>	Pecu		Chim trang
Common carp	<i>Cyprinus carpio</i>	Nai	Trey carb samanh	Ca chep
Giant freshwater prawn	<i>Macrobrachium rosenbergii</i>	Kungkamkram	Bongkong teok sap	Tom cang xanh
Giant gourami	<i>Osphromenus gourami</i>	Rad	Trey tror cheak damrey	Ca tai tuong
Giant snakehead	<i>Channa marulius</i>	Chado	Trey chhador	Ca loc
Grass carp	<i>Ctenopharyngodon idellus</i>	Gin yha	Trey carb sea samao	Ca tram co
Hybrid catfish	<i>Clarias macrocephalus / gariepenus hybrid?</i>	Duk oui	Trey anden koun kat	Ca tre lai
Kissing gourami	<i>Helostoma temmincki</i>	Mhor tarn	Trey kantrawb	Ca huong/mui
Mrigal	<i>Cirrhina mrigala/cirrhosus</i>	Nuan jun tade	Trey krawlang	Troi trang
Mud carp	<i>Cirrhina molitorella</i>	Gang	Trey phkar kor	Thoi loi
Nile tilapia	<i>Oreochromis niloticus</i>	Nin	Trey tilapia chhnoht	Ro phi
Pangasius catfish1	<i>Pangasius bocourti</i>	Ai dong, yang	Trey bra	Ca basa
Pangasius catfish2	<i>Pangasius hypophthalmus</i>	Sa whaai, suey	Trey bra	Ca tra
Red tail tinfoil				
Red tilapia	<i>Oreochromis sp.</i>	Taptim	Trey tilapia krohorm	Dieu hong
Rohu	<i>Labeo rohita</i>	Yisook		Rohu
Silver barb	<i>Puntius gonionotus</i>	Tapian	Trey chhpin brak	Me vinh
Silver carp	<i>Hypophthalmichthys molitrix</i>	Sawai	Trey carb brak	Me trang

Snakeskin gouramy	<i>Trichogaster pectoralis</i>	Salid	Trey kawnthor	Ca sac
Striped snakehead	<i>Channa striata</i>	Chon	Trey phtuok / raws	Loc bong
Three spot gourami	<i>Trichogaster trichopterus</i>	Kradee	Trey kompleanh	
Trey Riel	<i>Henicorhynchus siamensis</i>		Trey riel	
Walking catfish	<i>Clarias batrachus</i>	Dukdan	Trey andeng	Ca tre phi
Wild shimp		Kung Pra	Kampes	Tom tu nhien

Table 1 List of organisms involved in or associated with aquatic food production in the peri-urban of Bangkok, Hanoi , HCMC, and Phnom Penh with their Latin and common names (Source: PAPUSSA Survey)

Trajectory means “a path through time” while ‘livelihood trajectory’ refers to the “consequences of the changing ways in which individuals construct a livelihood over time” (Bagchi *et al.* 1998: 457). A livelihood is composed of “...the capabilities, assets (including both material and social resources) and activities required for a means of living” (Carney 1998: 4 as quoted in Rakodi 2000: 3) and “build their [poor people’s] worlds” (Whitehead 2002: 577). Our understanding of trajectories of change is based on the livelihood approach as used by a number of authors (for example, Carney 1998, Chambers 1995, Ellis 1998, 2000, Murray 2002, Rakodi 2002).

This report is guided by several questions, as follows:

- How far do the identified regional trends resonate with specific city experiences? If there are significant differences, why do these occur?
- What are the spatial and temporal patterns of change?
- Is it possible to generalise about the state and trajectory of AFPS in the region? Is there, in other words, a degree of path dependency in terms of the development of AFPS in peri-urban spaces?
- Should – and can – AFPS be viewed in isolation from other activities or should they be seen as part of interlinked livelihood complexes?

2 Introduction

In this report, we try to illustrate the ‘messiness’ of the transitions underway in the major cities of mainland Southeast Asia, and the range of factors and dimensions which inform and mould the practise of livelihoods, in general, and AFPS, in particular, within a dynamic peri-urban context. We use the results of the baseline and monitoring surveys carried out in 2003 and 2004. The implications of these results are discussed in the conclusion.

3 Household membership

City	N	Minimum	Maximum	Mean	Std. Deviation
Bangkok	212	1	9	4.37	1.677
Hanoi	210	1	11	4.87	1.499
Ho Chi Minh City	197	1	13	4.23	1.989
Phnom Penh	200	1	14	6.16	2.790

Table 2 Mean number of household members

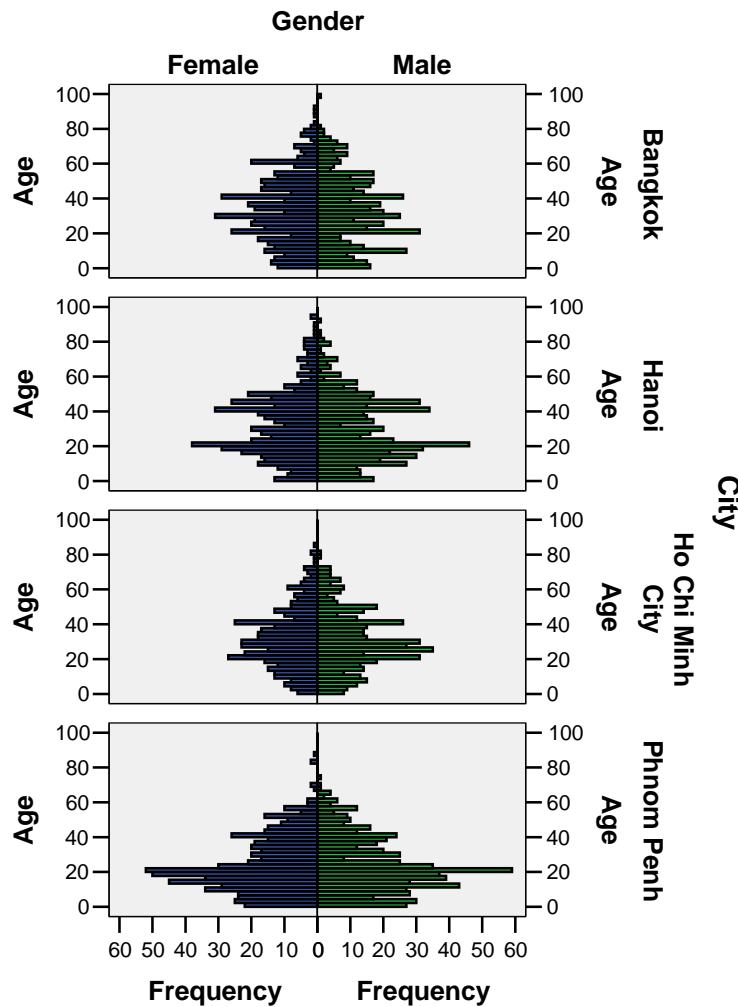


Figure 1 Age pyramids of surveyed households

The baseline and monitoring surveys covered, in total, some 818 households across the four cities (212 in Bangkok, 210 in Hanoi, 197 in HCMC, and 200 in Phnom Penh) with a total household membership of 4,016 as enumerated at the end of the last monitoring. The average household size was 4.9 members with a high of

6.2 for Phnom Penh decreasing to 4.9 for Hanoi, 4.4 for Bangkok, and 4.2 for HCMC (Table 2). The significantly higher average household size for Phnom Penh is not explained by larger families (more children) but, in the main, by the presence of extended family members (Table 4). Those who consider themselves household heads cover only 20% of the total surveyed population.

Table 3 reveals that Hanoi households are generally larger with 90% of households having 4 or more household members followed by Phnom Penh with 82%, Bangkok with 68%, and HCMC with 60%. If we only look at the category 'more than 5 members', Phnom Penh has the larger households with 57% in this category. Furthermore, in Table 3, there are 12 individuals who considered themselves living alone. Only 5 of them are married consisting of 2 individuals from Bangkok, 2 from Phnom Penh and 1 from HCMC. The others in the 'living alone' category are distributed as follows: 3 widowed, 3 unmarried, and 1 separated.

The fact that there are 12 people living alone deserves explanation because 'living alone' is atypical in the Southeast Asian context, particularly among farming households. One possible reason is rural-to-urban migration. Of the seven married and unmarried individuals, only two of them are not migrants. Those who migrated to Phnom Penh from other provinces moved to look for work while those in Bangkok moved due to a work-related reason and marriage. But we suspect that there may also be a problem in survey enumeration. In some instances, interviews were undertaken in work sheds or farm cottages which were not the respondents' main dwelling, but which may have been taken as the frame of reference in answering the question. This situation applies, for example, to some fish producers where there are work sheds in the farm containing supplies and equipment, such as the catfish producers in Bangkok especially Lumsai and Moo 1 Suanprixthai.

		City				
		Bangkok	Hanoi	Ho Chi Minh City	Phnom Penh	Total
Household membership	Living alone	5	1	2	4	12
		2.4%	.5%	1.0%	2.0%	1.5%
	2-3 members	63	20	78	33	194
		29.7%	9.5%	39.6%	16.5%	23.7%
	4-5 members	95	134	72	49	350
	44.8%	63.8%	36.5%	24.5%	42.7%	
	More than 5 members	49	55	45	114	263
		23.1%	26.2%	22.8%	57.0%	32.1%
Total		212	210	197	200	819
		100.0%	100.0%	100.0%	100.0%	100.0%

Table 3 Number of household members, by household size category

Relation	City				Total
	Bangkok	Hanoi	Ho Chi Minh City	Phnom Penh	
Child of HH head/spouse	373 40.2%	474 46.3%	430 51.6%	657 53.3%	1934 48.2%
Grandchild of HH head/spouse	75 8.1%	52 5.1%	21 2.5%	36 2.9%	184 4.6%
Household head	211 22.8%	210 20.5%	197 23.6%	198 16.1%	816 20.3%
Nephew/niece of HH head/spouse	20 2.2%	6 .6%	4 .5%	38 3.1%	68 1.7%
Non-relative	3 .3%	28 2.7%	1 .1%	18 1.5%	50 1.2%
Other extended family	29 3.1%	4 .4%		21 1.7%	54 1.3%
Parent of HH head/spouse	18 1.9%	36 3.5%	10 1.2%	16 1.3%	80 2.0%
Sibling of HH head/spouse	19 2.0%	4 .4%	8 1.0%	77 6.3%	108 2.7%
Spouse of household head	179 19.3%	209 20.4%	163 19.5%	171 13.9%	722 18.0%
Total	927 100.0%	1023 100.0%	834 100.0%	1232 100.0%	4016 100.0%

Table 4 Relation to household head of household members

Table 4 shows the relationship of the household head to household members. Nearly half of the sample comprised children of the household head/spouse and when this is combined with the household head and their spouse (representing the nuclear family) the proportion rises to nearly 90%. The gender balance for the survey as a whole is almost equal (51:49), although both HCMC and Hanoi reveal a gender balance slightly more biased in favour of males in the ratio of 52:48 (Table 5).

		City				
		Bangkok	Hanoi	Ho Chi Minh City	Phnom Penh	Total
Gender	Female	470	486	398	618	1972
		50.7%	47.5%	47.7%	50.2%	49.1%
	Male	457	537	436	614	2044
		49.3%	52.5%	52.3%	49.8%	50.9%
Total		927	1023	834	1232	4016
		100.0%	100.0%	100.0%	100.0%	100.0%

Table 5 Gender distribution among the four cities

4 Changes in household composition through time

Figure 2 shows the total population of the surveyed households over the survey period. Phnom Penh not only has the highest average household size but also the greatest fluctuation in household size over time. Since nearly 70% of households sampled in Phnom Penh came from an area considered an informal settlement, BCE Lake, we speculate that the fluctuation in household membership here is related partly to its dormitory function. Relatives from outlying provinces using kinship networks access temporary accommodation while looking for jobs in the city. Another contributing factor may be associated with variations in labour demand linked to the seasons and continuing functional links between households in the Phnom Penh peri-urban zone and villages of origin in the countryside. It was noted earlier that the surveyed population in Phnom Penh are much more likely to be recent migrants than in the other three cities and fluctuating household membership may be linked to greater settlement turbulence in 'younger' settlements (see below).

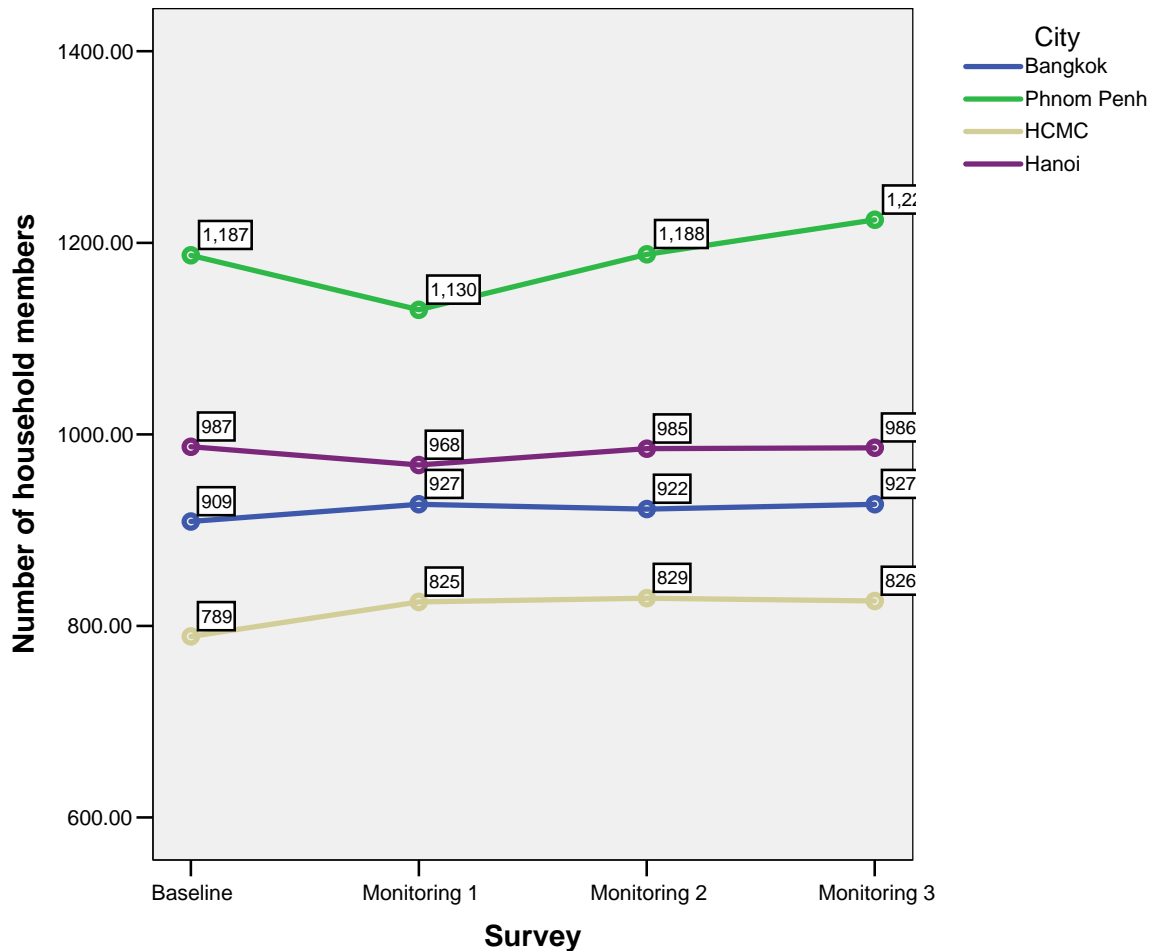


Figure 2 Household membership through time

To investigate this further, we first need to look at who these new household members are and then identify their reasons for moving and settling in the survey settlements. Half of the migrants are siblings (and their spouses) of household heads. Another 40% are other extended family members such as nephews, nieces, and in-laws. The large majority of extended family migrants came from outlying provinces including Takeo, Kandal, Prey Veng, Kompong Speu and Svay Rieng. Non-relatives accounted for less than 10% of in-migrants. The motivation for moving was largely economic with three-quarters of family and extended family migrants saying they moved to find work. This work was mainly in morning glory farms (71%), followed by fish farms (9%), factories (4%), as drivers (4%), and in construction (2%).

It would seem from these data that migration into the household is associated with siblings and other extended family members moving to work in morning glory farms, although it is unclear whether this is paid or unpaid labour. Unfortunately, the survey data do not allow us to identify whether the fluctuation in household composition is part of a cyclical, seasonal shift in membership or reflects a longer-term and more permanent transition. Regarding the former, it may be that the seasonal nature of labour demand in morning glory field sucks family labour in

from the countryside during peak months. Farmers need extra hands, for example, to prepare the morning glory fields following the flooding season to repair stakes and ropes for the next crop. Supporting this interpretation is the fact that the net increase recorded in the survey occurred after the flooding months, specifically November. Equally, it could be that the explanation lies further afield, in the rural hinterlands where, for instance, the onset of the dry season releases labour for work in the city and labouring on morning glory farms is just one possibility among several. In other words, we may need to envisage Phnom Penh households and rural villages of origin as more tightly linked, both functionally and emotionally, than we originally imagined and than in the other study sites. There is also a third contributing factor, namely that the inflow of migrants should be seen not just as an economic response to poverty and underproduction in the countryside but also as a rite of passage whereby young men and women come to the city as part of a process of attaining maturity as well as to escape the drudgery of rural, agricultural life.

5 The household heads

The mean ages of household heads across the different cities varies between a high of 51 years in Bangkok and a low of 43 years in Phnom Penh (Table 6). The ages of household heads in Hanoi and HCMC are nearly similar at 48 and 47 years.

City	N	Minimum	Maximum	Mean	Std. Deviation
Bangkok	209	20	98	50.85	13.960
Hanoi	210	27	78	47.51	10.180
Ho Chi Minh City	197	23	82	46.75	13.505
Phnom Penh	198	20	74	42.93	11.041

Table 6 Age of household heads

Although household heads are largely men, a significant number of household heads in Bangkok and HCMC are women (Table 7). The proportion of female-headed households in the Bangkok survey is a few percentage points less than the available national survey at 21.8% versus (based on the 2000 census) 26.2%¹. With respect to Hanoi, HCMC, and Phnom Penh, the proportion of female-headed households in the survey was considerably lower than the national figures. In Viet Nam, 21.6%² of households in the 1997/98 Vietnam Living Standards Survey were headed by women (General Statistical Office 2004:20). In Cambodia, meanwhile, 29.2%³ of households were recorded as being headed by females in 2004 (National Institute of Statistics 2004:11-12). The figures from the survey for these two cities were 8.6% and 10.1%. While many men died or were killed during the Pol Pot period, leaving a legacy of female-headed households (Gottesman

¹ This is based on a national census of population and housing conducted in 2000 (National Statistical Office 2003).

² This is based on a partial panel sample of 6000 households selected throughout the country but based on the pre-existing sample from the VLSS 1992-1993. This may have posed biases against young and newly established households and recent in-migrant households (General Statistical Office 2004:6-7).

³ This is based on an Inter-Censal Population Survey carried out on a de facto basis where if the usual household head is not around, the person managing the household during the household head's absence is considered the household head. This situation has been noted to have likely inflated this figure (National Institute of Statistics 2004:11).

2003), it may be that the selective demand for male labour in some AFPS means that there are particular constraints on the engagement of female-headed households in the occupation and associated activities.

		City				
		Bangkok	Hanoi	Ho Chi Minh City	Phnom Penh	Total
Gender	Female	46 21.8%	18 8.6%	34 17.3%	20 10.1%	118 14.5%
	Male	165 78.2%	192 91.4%	163 82.7%	178 89.9%	698 85.5%
Total		211 100.0%	210 100.0%	197 100.0%	198 100.0%	816 100.0%

Table 7 Gender of household heads

Female household heads are on average older than male household heads at 52 versus 46 years old. Hanoi has the oldest female household heads with a mean of 58.6 (SD=11.449) followed by Phnom Penh at 51.1 (SD=9.840), HCMC at 49.4 (SD=16.949) and Bangkok at 48.9 (SD=13.446). The trend for the age of male household heads parallels that of the mean for both genders: Bangkok, 51.4 years (SD=14.091); Hanoi, 46.5 (SD=9.443); HCMC, 46.0 (SD=12.666); and, Phnom Penh, 42.0 (SD=10.812) (Table 6). The older average age of female household heads points to widowhood as a factor. Thirty percent (30%), 61%, 21%, and 50% of female headed households in Bangkok, Hanoi, HCMC and Phnom Penh, respectively, are widows with Hanoi and Phnom Penh revealing a significantly higher number of widows (Table 8). In Bangkok and HCMC, however, a large number of female household heads are currently married. It seems that for Bangkok particularly, female headship is not restricted to those instances when an adult male, usually a husband, is absent. Nor is this situation new. Studies of slum and squatter settlements in Bangkok dating from the early 1970s also note the existence of female-headed households despite the presence of a husband (Keyes 1977: 316). This needs to be contextualised in terms of wider gender roles and gender relations in Thailand and the wider region.

		City				Total
		Bangkok	Hanoi	Ho Chi Minh City	Phnom Penh	
Marital status	Unmarried			1 2.9%	4 20.0%	5 4.2%
	Married	30 65.2%	7 38.9%	25 73.5%	5 25.0%	67 56.8%
	Separated	2 4.3%				2 1.7%
	Divorced			1 2.9%	1 5.0%	2 1.7%
	Widowed	14 30.4%	11 61.1%	7 20.6%	10 50.0%	42 35.6%
	Total	46 100.0%	18 100.0%	34 100.0%	20 100.0%	118 100.0%

Table 8 Marital status of female household heads

The education of household heads stratified by gender is presented in Table 9. In Bangkok, some three-quarters of household heads, both male and female have only a primary level education at best. In Hanoi, 84% of male household heads have entered or finished secondary education while the figure for female household heads is less than half this at just 40%. Indeed, 22% of female household heads in Hanoi have no formal education at all. In HCMC, 56% of female household heads have entered or finished primary education while 52% of male households heads have done so. Phnom Penh shows the highest number of household heads with no education at all -- 55% of female household heads and 18% of males. This is likely linked to the events that marked the Pol Pot regime, especially the killing of 'intellectuals' – a term which, for the Khmer Rouge, even included those with secondary level education. Reflecting the gender divide in education at the time, these were inevitably largely males. In short, when the Khmer Rouge took power in mid-1975, the country was purged of nearly all its educated class. Teachers were killed and schools and books were destroyed. What was left of the country's education system during Lon Nol's time was wiped out. People were sent to the countryside (Asian Development Bank. 1996:2-3, Duggan 1996:362, 365). Gottesman (2003: 73) notes that

No other ethnic Khmers had suffered more under Democratic Kampuchea than the "intellectuals" (a term used by the Khmer Rouge and the PRK to refer to those with a high school education). According to Party estimates, a mere 15 percent of educated Cambodians had survived.

			City				
Gender			Bangkok	Hanoi	Ho Chi Minh City	Phnom Penh	Total
Female	Education	Entered or finished primary education	36 78.3%	6 33.3%	19 55.9%	7 35.0%	68 57.6%
		Entered or finished secondary education	1 2.2%	7 38.9%	10 29.4%	2 10.0%	20 16.9%
		Further education	1 2.2%	1 5.6%	1 2.9%		3 2.5%
		No formal education	8 17.4%	4 22.2%	4 11.8%	11 55.0%	27 22.9%
		Total	46 100.0%	18 100.0%	34 100.0%	20 100.0%	118 100.0%
Male	Education	Entered or finished primary education	118 72.4%	13 6.8%	60 36.8%	95 53.4%	286 41.1%
		Entered or finished secondary education	22 13.5%	161 83.9%	85 52.1%	49 27.5%	317 45.5%
		Further education	3 1.8%	18 9.4%	3 1.8%	2 1.1%	26 3.7%
		No formal education	20 12.3%		15 9.2%	32 18.0%	67 9.6%
		Total	163 100.0%	192 100.0%	163 100.0%	178 100.0%	696 100.0%

Table 9 Education of household heads

Thus, if the ‘intellectuals’ sampled in Phnom Penh had survived, then it must be their indomitable spirit, courage, and no small amount of luck that must have got them through the Pol Pot years. To quote Gottesman (2003: 73) again,

One of the many sad ironies was that the more leftist a student, teacher, or professional had been at the time of the revolution, the less likely he or she was to survive. Only those suspicious enough of the revolution to have hidden their identities rather than offer their services to the Khmer Rouge remained alive in 1979.

What is perhaps most surprising, at least at first glance, is the relatively low education status of the Bangkok heads of household. Some 94% have either no or only primary level education, as opposed to 54%, 68% and 90% for Hanoi, Ho Chi Minh City and Phnom Penh respectively. There are two ways of interpreting this situation in Bangkok. One is pragmatic and another historical. Given that Bangkok is by far the wealthiest and most ‘developed’ of the four cities, this may indicate that in Thailand such aquatic food production systems have become the occupations of those who are unable – for reasons of education – to access employment alternatives in the formal sector but possess or have access to land which serves as a springboard to other occupations in the agriculture or aquaculture sectors.

However, historically, it appears that the early schooling years during the 1950s and 1960s of the older household heads in Bangkok coincided with a period in Thailand’s educational development when secondary education was low. The World Bank (2001: iii) noted that

Historically, the limited provision of secondary education was a major bottleneck in skills development in Thailand. Enrollment rates lagged considerably behind those in other countries in the region in the 1970s and 1980s. Major expansion in the 1990s, however, lifted enrollment rates to about 72 percent at the lower secondary level by the end of the decade, and 48 percent at the upper secondary level, for both boys and girls. About 40 percent of these students were enrolled in vocational secondary schools. If we also count those enrolled in non-formal programs, the proportions enrolled at the lower and upper secondary levels rise to about 90 percent and 50 percent. (The World Bank 2001:iii)

The level of secondary enrolment during first half of the 1960s was only 2% of the age group⁴ then the gross enrolment rate rose to only around 30% in the 1980s. Such poor state of secondary education in Thailand in the 1970s and 1980s resulted in 83% of workers having only primary education or less in 1990. But competitive pressures during the early 1990s from a globalising economy required the Thai labour force to attain at least secondary education as a minimum requirement. The government then responded with a series of measures such as extending the basic education cycle from 6 to 9 years, focusing on raising the transition rate between grades 6 and 7, and providing subsidies to families to reduce educational costs. These measures and the corresponding improvement in household income during that period have led to an increase in lower secondary enrolment from 34% to 63% between 1989 to 1994 (The World Bank 1998:6, 10). Thus, succeeding generations of the AFPS household heads in Bangkok are likely to have higher educational attainment than their parents.

6 Characteristics of other household members

Household members who are not household heads are considered here to belong to the category “other household members”⁵. Phnom Penh households are generally younger as shown in Table 6 and Table 10. In both tables, it is shown that Phnom Penh has the youngest age group followed by HCMC, Hanoi and finally Bangkok.

City	N	Minimum	Maximum	Mean	Std. Deviation
Bangkok	716	0	92	28.69	18.326
Hanoi	813	1	94	27.20	18.488
Ho Chi Minh City	637	1	86	26.76	15.394
Phnom Penh	1034	0	87	20.75	13.846

⁴ In this period, primary education and public higher education were the major concerns especially for investments. The First National Education Development Scheme, which ran from 1960 to 1976, was introduced to improved access to primary education. During the 1960s, the government’s efforts were directed at increasing enrolment rates instead of improving the overall quality of education as well as addressing social equity and distribution issues (The World Bank 1998: 6).

⁵ The way the questionnaire was coded do not allow for specific analysis of children alone especially in cross-country analyses.

Table 10 Age characteristics of other household members

Table 11 describes the education of 'other' household members who are above 6 years of age. It is noteworthy that Vietnamese cities have proportionately more 'other' household members who have entered or finished secondary education than Bangkok or Phnom Penh. In the latter cities, more than half of the other household members in the surveyed households have only entered or finished primary education. Phnom Penh has more 'other' household members (28%) with no formal education.

		Education				
		Entered or finished primary education	Entered or finished secondary education	Further education	No formal education	Total
City	Bangkok	325	166	95	48	635
		51.2%	26.1%	15.0%	7.6%	100.0%
	Hanoi	114	510	96	20	740
		15.4%	68.9%	13.0%	2.7%	100.0%
	Ho Chi Minh City	193	335	36	20	584
		33.0%	57.4%	6.2%	3.4%	100.0%
	Phnom Penh	518	171	13	187	889
		58.3%	19.2%	1.5%	21.0%	100.0%
Total		1150	1182	240	275	2848
		40.4%	41.5%	8.4%	9.7%	100.0%

Table 11 Education of other household members above 6 y.o.

7 Occupational multiplicity

Occupational sector	City				Total ^f
	Bangkok ^a	Hanoi ^b	Ho Chi Minh City ^c	Phnom Penh ^d	
Agriculture ^e	64 30.3%	1 .5%			65 4.9%
Aquatic plants production	58 27.5%	49 23.3%	100 50.8%	123 62.1%	330 25.0%
Assemblers, machine operators	1 .5%	13 6.2%		12 6.1%	26 2.0%
Dependents ^g	22 10.4%	8 3.8%	6 3.0%		36 2.7%
Education ^h	1 .5%	1 .5%	1 .5%	1 .5%	4 .3%
Fish production	62 29.4%	152 72.4%	102 51.8%	83 41.9%	399 30.2%
Leaders	4 1.9%	12 5.7%	2 1.0%	1 .5%	19 1.4%
Livestock	4 1.9%	189 90.0%	44 22.3%	12 6.1%	249 18.8%
Medical				1 .5%	1 .1%
Other professionals	9 4.3%	6 2.9%	2 1.0%		17 1.3%
Personal services, sales	5 2.4%	4 1.9%	7 3.6%	7 3.5%	23 1.7%
Security services	2 .9%	5 2.4%		2 1.0%	9 .7%
Skilled manual labour	5 2.4%	32 15.2%		13 6.6%	50 3.8%
Students	1 .5%				1 .1%
Unskilled work	38 18.0%	21 10.0%	14 7.1%	20 10.0%	93 7.0%
Total	276 100.0%	493 100.0%	278 100.0%	275 100.0%	1322 100.0%

a. % within n=211

b. % within n=210

c. % within n=197

d. % within n=198

e. % within N=1322

f. E.g., rice farming and gardening

g. E.g., pupils, handicapped persons, and retired persons

h. E.g., teachers and instructors

Table 12 Occupations of household heads

In terms of the occupations of household heads (HHH), Table 12 shows that a significant number of household heads are involved in other productive activities as well as AFPS. Occupational multiplicity or pluriactivity would seem to be a common feature of livelihoods in the study sites, rather than specialisation. It is likely that HHH juggle different occupations depending on the season and the demand for their labour. In Bangkok, the major occupations HHH are involved with relate to agriculture (30%), fish production, (29%), aquatic plant production (28%), and unskilled work (18%). In Hanoi, HHH are primarily involved in livestock (90%) and fish production (72%) with a smaller proportion engaged in aquatic plant production (23%) and unskilled work (10%). The high involvement by farmers in Hanoi in both livestock and fish production reflects the importance of the VAC production system here. VAC stands for the Vietnamese terms *vuon*, *ao*, and *chuong* which means garden, pond, and livestock. VAC systems are integrated systems with the above three components and are small-scale and are at the level of the household. These systems dominate the Red River Delta. Livestock raising is a secondary occupation among VAC households (Luu *et al.* 2002:56, 60).

As regards the other cities, involvement in livestock is not nearly as extensive as it is in Hanoi. In HCMC, the occupational make up is nearly evenly divided between aquatic plant production (51%) and fish production (52%). Only 22% of HHH in HCMC are involved in livestock raising, less than a quarter of the rate in Hanoi. In Phnom Penh, more HHH are involved with aquatic plant production (62%) than fish production (42%). This difference can be attributed to the strong sampling bias in favour of aquatic plant producers, which was not the case in the other cities where attempts to obtain an equal representation of the two major AFPS in the survey were made. Only 10% of HHH in Phnom Penh are involved in unskilled work.

City	N ^a	Minimum	Maximum	Mean	Std. Deviation
Bangkok	201	1	3	1.38	.571
Hanoi	209	1	3	2.36	.622
Ho Chi Minh City	193	1	5	1.44	.652
Phnom Penh	191	1	3	1.44	.594

a. In Bangkok, HCMC, and Phnom Penh, these figures are lower than the actual surveyed populations as not all respondents were HHH.

Table 13 Mean number of occupations of household heads in each city

Table 13 and Figure 3 support the initial assertion that household heads in Bangkok tend to be specialists in AFPS by virtue of the fact that they have fewer occupations compared with the other cities. On average, Bangkok has the smallest mean number of occupations at 1.38 whereas Hanoi has the highest at 2.36. HCMC and Phnom Penh lie in the middle with the same mean. Despite with low mean number of occupations compared with Hanoi, HCMC showed the most number of households with multiple occupations.

In Hanoi, there are more HHH with three occupations. This can be explained by looking at Table 12 where the different occupational categories are listed. Hanoi as compared with other cities has more households who raise livestock, even higher than aquatic plants or fish occupations. Thus, a large number of HHH in Hanoi are also involved in this activity as one of their main occupations. The question now is

whether livestock itself is the main activity, or AFPS. It appears that due to the level of integration among various agricultural systems in Hanoi pigeonholing them as either aquatic or non-aquatic households is not of great help. Indeed, it may artificially sub-divide a system whose very logic is founded on its integration as a multi-functional unit. Households tend to optimise their involvement in agriculture and aquaculture by integrating them so that a system such as VAC, unique to the Red River Delta region, was developed.

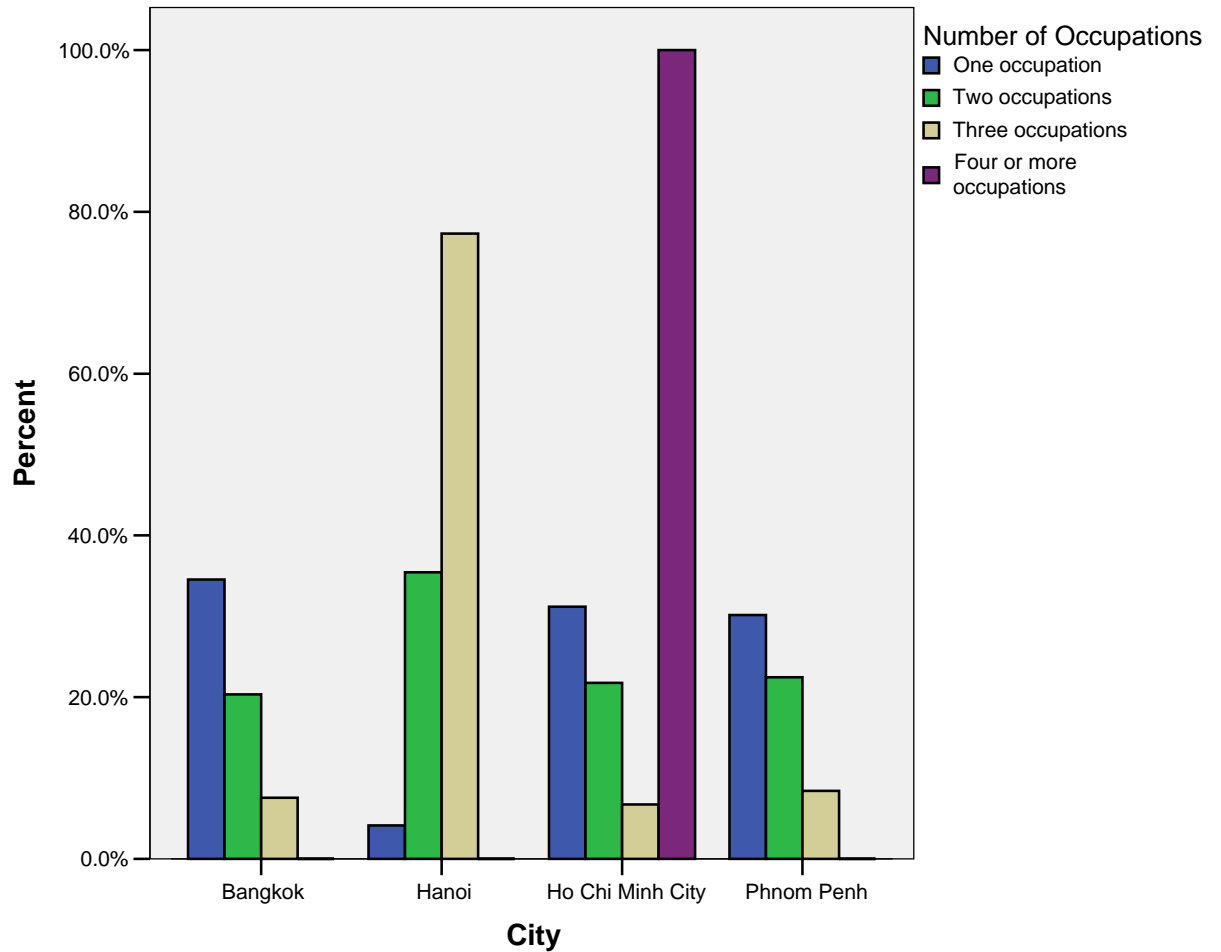


Figure 3 Occupational multiplicity of HHH

For the purpose of analysing occupational characteristics, the “other household members” category are divided into children below 12 years of age and those above 12 years old. Those who are above 12 years old could be the spouses of the HH head, their children, other dependents, and non-relatives. This age is used as the basis of the minimum age of admission into AFPS based on the International Labour Organisation’s convention on child labour known as the “Minimum Age Convention, 1973 (No. 138)”⁶. It is very likely that children below 12

⁶ According Convention 138, the general minimum age for admission to employment shall not be less than the age of completion of compulsory schooling and should not be less than 15 years (International Labour Organisation). Such convention prescribes the age of admission for light work at 12-13 years old. Light

years old are employed in AFPS, particularly in Phnom Penh, but since the survey was not a labour force survey the level of participation of children in production activities was not explored. It bears noting though that, according to Ben White (2004: 78), "The great majority of working children ...[in Southeast Asian countries]...are employed in agriculture or other rural occupations, and in family farms or other small-scale enterprises. Many combine work and school; for some...work is the only way to stay in school." While White is no doubt correct in highlighting the productive role played by children in the region, it is also worth highlighting that the level of engagement will vary between countries and, in all likelihood, between the research sites.

Since the focus⁷ of this study is AFPS, naturally there will be more household members within the occupational categories associated with AFPS. However as shown in Table 14, AFPS household members above 12 years old are also involved in productive activities which are not necessarily AFPS-related, such as in professional work, security services, and other forms of skilled and unskilled manual work. Nearly 20% of all household members are dependents. The dependents may be students, the handicapped, unemployed individuals, and retired persons.

work is defined as work which is not likely to be harmful to the health or development of children and which does not prejudice their schooling or their capacity to benefit from the instruction received (International Labour Organisation).

⁷ The selection of field sites and households in the survey intentionally selected AFPS households so that the outcome may best be interpreted as representing only those households involved in AFPS and not the general population of the area.

Occupational sector	City				Total
	Bangkok	Hanoi	Ho Chi Minh City	Phnom Penh	
Agriculture ^a	103 17.4%		4 .6%		107 3.9%
Aquatic plants production	81 13.7%	123 12.9%	147 23.6%	236 40.2%	587 21.3%
Assemblers, machine operators	5 .8%	15 1.6%	4 .6%	2 .3%	26 .9%
Dependents ^b	40 6.7%	121 12.7%	29 4.7%	11 1.9%	201 7.3%
Education ^c	4 .7%	9 .9%	5 .8%	1 .2%	19 .7%
Fish production	75 12.6%	167 17.5%	135 21.7%	98 16.7%	475 17.2%
Leaders	4 .7%	9 .9%	4 .6%	4 .7%	21 .8%
Livestock	2 .3%	260 27.3%	54 8.7%	8 1.4%	324 11.8%
Medical	5 .8%	4 .4%	6 1.0%		15 .5%
Personal services, sales	22 3.7%	38 4.0%	65 10.4%	19 3.2%	144 5.2%
Other professionals	28 4.7%	18 1.9%	5 .8%	4 .7%	55 2.0%
Security services	2 .3%	3 .3%	4 .6%	1 .2%	10 .4%
Skilled manual labour	34 5.7%	94 9.9%	28 4.5%	23 3.9%	179 6.5%
Students	68 11.5%	36 3.8%	75 12.0%	147 25.0%	326 11.8%
Unskilled work	120 20.2%	56 5.9%	58 9.3%	33 5.6%	267 9.7%
Total	593 100.0%	953 100.0%	623 100.0%	587 100.0%	2756 100.0%

a. E.g., rice farming and gardening

b. Eg., pupils, handicaps, and retired persons

c. E.g., teachers and instructors

Table 14 Other productive sectors of the peri-urban economy where AFPS household members are involved with

8 Natality and migration profiles of respondents⁸

Of the 200 producers interviewed in Phnom Penh, 70% of them were not born in the district, community or village where they are currently residing whereas the figures for the other cities were 24% of 197 producers in HCMC, 13% of 212 producers in Bangkok, and 4% of 210 producers in Hanoi. Thus, the producers in Phnom Penh with a mean age of 26.57 (SD=12.29) (Table 15) are overwhelmingly migrants from other provinces (91%) and have on average stayed at their current residence for 11.8 years (SD=7.76). We can, on the basis of these figures, characterise the Phnom Penh field sites as relatively 'young' in terms of their migration and natality profiles with a considerable degree of turbulence in the composition of their populations, as noted earlier. The other cities, by contrast, show a more mature migration/natality profile with a significantly lower number of in-migrants and a more established population. This is likely to have significant implications for other aspects of the study including patterns of work, land ownership profiles and the tenurial status of land holders, and the nature and operation of production systems.

The major reasons that respondents gave for moving to the field sites were to find work (32%), to follow or join their families (22%), to move into a new economic zone (15%), to pursue a work-related initiative (14%), due to war (8%), or due to marriage (7%). If we assume that the first, third and fourth of these causes are work related then 61% of moves were propelled primarily by work/livelihood concerns.

City		N	Minimum	Maximum	Mean	Std. Deviation
Bangkok	Age when respondent left	28	12	54	26.14	10.455
	Length of stay in current residence	28	2.00	40.00	20.0357	10.57769
Phnom Penh	Age when respondent left	139	2	55	26.57	12.298
	Length of stay in current residence	139	1.00	25.00	11.8129	7.76425
HCMC	Age when respondent left	47	10	64	30.79	11.918
	Length of stay in current residence	47	.08	44.00	7.8990	10.45267
Hanoi	Age when respondent left	8	1	40	18.38	13.511
	Length of stay in current residence	8	1.00	15.00	9.5000	5.15475

Table 15 Age at departure and length of stay of respondents

In terms of gender, more females migrated than males in Phnom Penh and Bangkok (56% vs 44%). In HCMC, nearly two-thirds of migrants were males (65%)

⁸ The respondents in this case may be interpreted to mean also equally as the household heads because the survey intentionally sought out household heads. However, not all households heads are respondents as section 3 shows.

while in Hanoi the figure was 57%. The latter figure, however, should be interpreted with caution as there were only 8 migrant producers in Hanoi, too small a sample to draw any firm conclusions.

The high male death rate during the Khmer Rouge period and the subsequent relocation of remaining household members to the city during the period of the 'Cambodian interlude' (i.e. during UNTAC) may account, in large measure, for the female/male imbalance in Phnom Penh. A case in point was Mrs Siv Sa, a 58 year-old mother from Kbal Tomnub Village, Boeung Tompun Commune, Meanchey District – who was interviewed in August 2005 – who lost her husband to the atrocities of Pol Pot. She settled in her current village in 1979 along with her two children.

9 Mobility and livelihood uptake

One way of identifying how a certain livelihood was adopted is to trace the previous involvement of other household members in a particular production system based on the assumption that households are fertile places where knowledge is transferred and engaged with. As shown in Table 16, a significant number of migrant producers (i.e. migrant household heads) in Bangkok, Phnom Penh, and Hanoi (74%, 66%, and 100% respectively) have no inherited link with AFPS production systems. Or to put it another way, no other members of these household previously operated AFPS. This is not, however, the case in HCMC where two-thirds of households had such an inherited association with AFPS. It seems that despite the knowledge-intensity of some forms of AFPS, in three of the four cities adoption is not strongly linked with the prior experience and engagement of other family members. This is supported by the data in Table 19 which shows that for the sample as a whole, 54% of producers acquired their knowledge from neighbours and just 9% from other family members. Surprisingly, this was also true for the HCMC case alone where the respective figures were 61% and 11%. As the succeeding tables below will indicate, it seems that the inter-generational transfer of knowledge is not significant when it comes to understanding who engages in AFPS. Prior or inherited knowledge would seem not to be important and this will have likely implications for the continuity of AFPS over time and patterns of entry/exit. On the basis of these data, it seems that the knowledge embeddedness of AFPS is not as high as we expected.

City	Previous operation of AFPS	Production categories				Total
		Aquatic plants	Fish	Hired labour only involvement	Plant / fish polyculture Rice	
Bangkok	Previously operated		6 85.7%		1 14.3%	7 100.0%
	Not previously operated	9 45.0%	10 50.0%	1 5.0%		20 100.0%
Hanoi	Not previously operated	1 12.5%	7 87.5%			8 100.0%
	Previously operated	23 74.2%	7 22.6%		1 3.2%	31 100.0%
Ho Chi Minh City	Not previously operated	14 87.5%	2 12.5%			16 100.0%
	Previously operated	29 61.7%	18 38.3%			47 100.0%
Phnom Penh	Not previously operated	54 58.7%	38 41.3%			92 100.0%

Table 16 Previous operation of production system by other household members

Table 17 takes the line of evidence and argument pursued in the last paragraph a little further. Overall, 85% of migrants had no experience of AFPS before coming to live in their current place of residence and take up aquatic production (Table 17). This indicates that locational factors may have prompted adoption rather than prior knowledge and experience. In these terms, the uptake of AFPS can be considered opportunistic and linked to the new geographies of opportunity (environmental and economic) that a change of residence created. That said, initial endowments cannot be discounted as a factor. This, therefore, leads us to hypothesise that AFPS are less 'sticky' than we anticipated and, on this basis, that transformations may be more dramatic than would be the case were the system to be tightly tied to inherited knowledge and experience. Furthermore, the history of AFPS as a livelihood may itself be also a source of explanation as to why knowledge and experience were not the main sources of know-how on the culture of AFPS. We can assume that the current producers of AFPS are pioneers or first generation adaptors. As such, the knowledge they deployed was not inherited from their forebears who were then practising other forms of livelihood, which is likely to be rice farming. As AFPS is stabilised as a form of livelihood in the peri-urban, we can assume that succeeding generations of adaptors would have used the generation before them as their sources of insights. In other words, the systems are relatively new compared to other livelihood systems in the landscape.

City	Prior work experience		Total
	Have worked before	None	
Bangkok	8 26.7%	22 73.3%	30 100.0%
Hanoi	1 14.3%	6 85.7%	7 100.0%
Ho Chi Minh City	4 8.7%	42 91.3%	46 100.0%
Phnom Penh	20 14.5%	118 85.5%	138 100.0%
Total	33 14.9%	188 85.1%	221 100.0%

Table 17 Prior work experience in AFPS before residing at current place

Since coming to live at their current residence, migrant household heads' involvement in AFPS has not been uniformly uninterrupted. Overall, around one half of migrants had moved out of AFPS on at least one occasion since settling. In Bangkok and HCMC, the figures are higher still at 60% and 72%. What is not clear from the data, however, is whether this reflects a complex and multiple shifting in and out of AFPS according to fluctuating market (or other) conditions or a simple one-time switch (Table 18). This is an important issue to address if we are to view patterns of work and activity in the cities as reflecting either a permanent shift from (or into) AFPS, or a situation where inter-locking livelihoods are the norm and households juggle AFPS with other forms of work according to market circumstances, environmental conditions and labour availability. There is, of course, also the possibility that what we see in the study sites is the co-existence of two livelihood strategies, one reflecting a specialised and full-time engagement with AFPS and the other a more shifting, opportunistic and mixed melding of AFPS with other activities.

City	AFPS involvement		Total
	Continuous work since residence	Not continuous	
Bangkok	12 40.0%	18 60.0%	30 100.0%
Hanoi	4 57.1%	3 42.9%	7 100.0%
Ho Chi Minh City	13 28.3%	33 71.7%	46 100.0%
Phnom Penh	79 57.2%	59 42.8%	138 100.0%
Total	108 48.9%	113 51.1%	221 100.0%

Table 18 Involvement in AFPS since taking up residence at current place

In terms of the sources of knowledge that propel migrant producers to adopt AFPS, it is noteworthy that commercial scale production in Bangkok was largely a product, seemingly, of farmers' own experiments (Table 19). This seems implausible for it is difficult to imagine that the intense use of inputs such as emulsifiers to hold pesticides on to leaves and chemicals to maintain the green colour of morning glory could be achieved without any knowledge transfer from an external source. Outside intervention is highly likely, whether through government extension or aggressive campaigns by chemical companies. What is notable in Table 19, however, is the apparently uniformly low role played by government extension in knowledge transmission. It would seem that the adoption of new systems and the acquisition of the associated and necessary knowledge are independent of government in Bangkok and not so much the case in Hanoi and HCMC. This is testament to the low profile of such production systems in relevant departments and ministries and to the ability of farmers, their families and friends, and the commercial sector successfully to promote, adopt and develop such systems. It would seem that not only does the peri-urban zone 'slip off the map' in terms of agricultural extension but AFPS in particular are prone to being ignored – at least officially – as important production systems and livelihood activities.

While government itself may not have an obvious role in the direct transmission of AFPS knowledge to producers, it is likely that government personnel privately provide consultancy services to farmers in Bangkok. It is a common knowledge in the fisheries sector that the staff members of various government agencies and universities dealing with fisheries are the sources of technical advice among fish farmers. For example, the original prototype for the processes of wastefed aquaculture involving pig and poultry manure as well as wet food from restaurants in Klong 3 in Pathumthani Province was introduced by the Asian Institute of Technology, a quasi-governmental postgraduate institution. Also, key faculty members of the Department of Fisheries of Kasetsart University and senior staff of the Department of Fisheries are consulting with farmers on how to improve their seeds and pond management.

City	Source						Total
	Own experiment	Neighbours	Friends	Gov't extension	Other family members	Vietnamese expert	
Bangkok	20	7					27
	74.1%	25.9%					100.0%
Hanoi	1	1	2	1			5
	20.0%	20.0%	40.0%	20.0%			100.0%
Ho Chi Minh City	10	28	3		5		46
	21.7%	60.9%	6.5%		10.9%		100.0%
Phnom Penh	40	80	3		14	1	138
	29.0%	58.0%	2.2%		10.1%	.7%	100.0%
Total	71	116	8	1	19	1	216
	32.9%	53.7%	3.7%	.5%	8.8%	.5%	100.0%

Table 19 Source of learning on AFPS

With respect to the persistence of AFPS practises, it would seem that in Hanoi and Bangkok there is considerable stability in AFPS types while in Phnom Penh and HCMC change is much more likely (Table 20). Nearly one half of producers in these latter two cities have switched to different farmed species according to market opportunities. Bangkok once again poses something of an enigma as it has the longest mean length of stay (period of residence) (see Table 15) but at the same time 96% of producers say that they have not made any notable changes to the type of AFPS they practise. It may be that this reflects the size of production units in Bangkok and the much larger investments that such units embody which, when combined, result in a lack of agility and therefore a tendency towards continuity rather than change.

City	Persistence in AFPS		Total
	Changed	No changes	
Bangkok	1	26	27
	3.7%	96.3%	100.0%
Hanoi	1	4	5
	20.0%	80.0%	100.0%
Ho Chi Minh City	24	22	46
	52.2%	47.8%	100.0%
Phnom Penh	61	77	138
	44.2%	55.8%	100.0%
Total	87	129	216
	40.3%	59.7%	100.0%

Table 20 Persistence of type AFPS practised

10 Major household activities

Obviously, the focus of our surveys was on households involved in the production of fish and aquatic vegetables in peri-urban areas of the selected Southeast Asian cities. Thus, the main categories of production where labour is being allocated are aquatic plants and fish, as shown in Table 21. These two culture categories alone account for 85% of all recorded activities in the four cities. The figures in Table 21 should not, however, be taken as representative of the normal distribution of work in the peri-urban zone or, indeed, even in the villages selected. They reflect the survey protocols adopted and the households selected for study.

Categories of production systems	Frequency of mention ^f	Percent
Labouring ^a	3	.1
Mixed systems ^b	3	.1
Plant / fish polyculture	4	.1
Indirectly AFPS ^c	11	.3
Non-AFPS ^d	14	.4
Other land crops ^e	15	.5
Rice	27	.8
Land vegetable	80	2.5
Livestock	327	10.2
Fish	1237	38.6
Aquatic plants	1480	46.2
Total	3201	100.0

a. Refers to hired labour

b. Disparate systems but not integrated as in VAC, e.g. rice-fish, rice-aquatic plants, rice-land vegetables etc.

c. Activities related to AFPS, but are not themselves AFPS

d. Referring to activities such as small-scale textile, flower plantation, tending to ornamental plants, selling eggs and selling fruits.

e. For example, orchards.

f. This refers to the number of times an activity is mentioned by respondents.

Table 21 Household activities by categories of production

11 Role of labour in the production systems

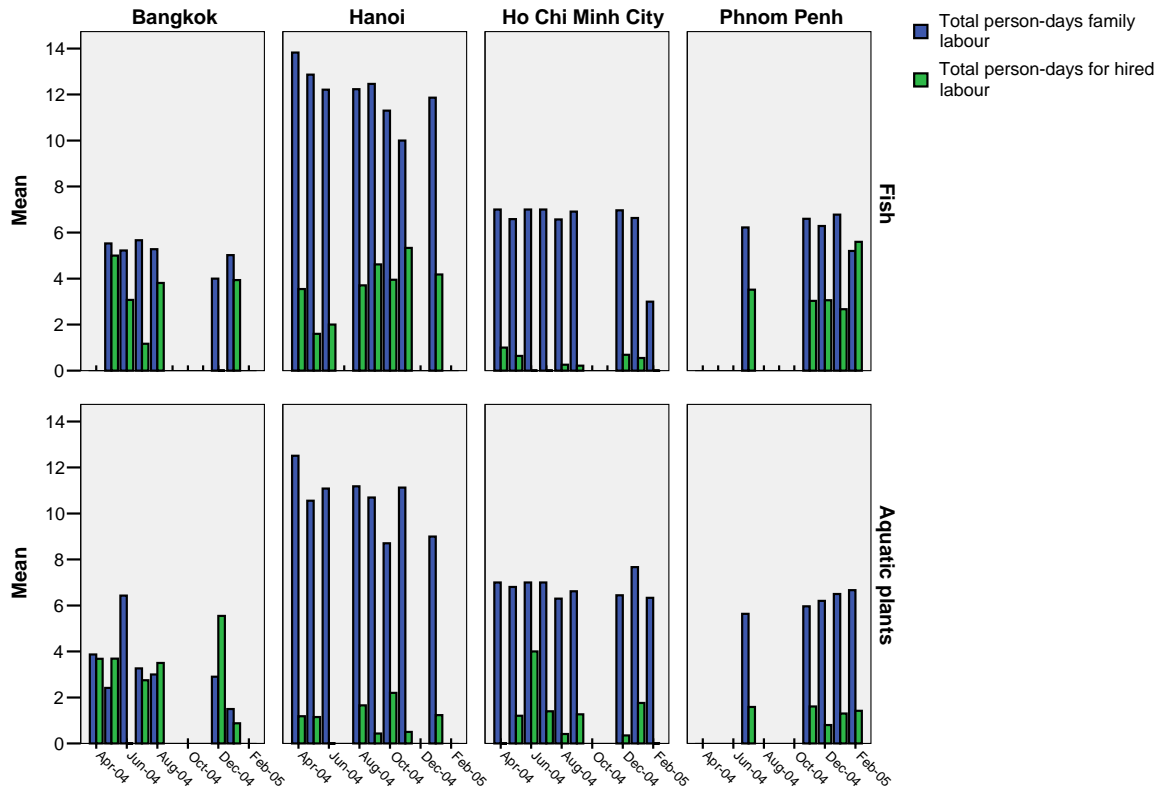


Figure 4 Use of family and hired labour in the fish and aquatic plants production systems

Notwithstanding the survey shortcomings noted earlier in this paper, there are several important points to note regarding the trends in seasonal labour use in Figure 4. First, and at an aggregate level, the use of family labour is important in AFPS especially in non-commercial scale operations such as those that are prevalent in Hanoi, Phnom Penh, and HCMC. The mean total person days of family labour versus hired labour are: 11.35 (SD=5.50) versus 2.13 (SD=8.31) for Hanoi; 6.20 (SD=1.50) versus 2.08 (SD=2.78) for Phnom Penh; and 6.78 (SD=2.69) versus 0.83 (SD=2.21) for HCMC (Appendix 1). The figures indicate that for these three cities households involved in producing fish and aquatic plants depend, largely, on family labour. One attraction of AFPS, whether fish or aquatic plants, is that such systems can be integrated with other household activities such as feeding livestock or maintaining market gardens. This is particularly true of aquatic vegetable production which shows a greater reliance on family labour and, moreover, a higher level of participation by women especially in the case of Hanoi (Nguyen Thi Dieu Phuong *et al.* 2006), HCMC (Huynh Pham Viet Huy and Le Thanh Hung 2006) and Phnom Penh (Kuong, Little, and Leschen 2006). It seems that the production demands of aquatic vegetables can be more easily structured and dove-tailed around the other productive and reproductive tasks that women undertake. Men, in general, are more fully involved in fish production.

Second, intuitively there appears to be a correlation between the level of commercialisation and the use of family versus hired labour. Among fish and aquatic plant producing households in Bangkok, the use of family and hired labour are in rough balance at 4.24 (SD=3.14) and 3.60 (SD=5.77) person days. The units of production in Bangkok are significantly larger than they are in the other three cities and, furthermore, the level and nature of production reflect a greater intensity of engagement. In Bangkok, AFPS have, in general, made the transition from being a 'way of life', to becoming a business. However it is not just that systems in Bangkok are larger, more commercialised, and operate at a higher level of intensity; there is also a higher level of competition between AFPS and other activities available to householders. Due to competing demands from a dynamic labour market, AFPS operators in Bangkok have to depend on hired labour as, in many cases, family labour is being attracted into more lucrative alternative occupations and activities reflecting the continuing development of human capital through education and the acquisition of new skills. Table 22 shows a trend that adult children in Bangkok have higher education than their parents.

City	Relation	Education ^a				Total
		Entered or finished primary education	Entered or finished secondary education	Further education	No formal education	
Bangkok	Household head	154	23	4	30	211
		73.0%	10.9%	1.9%	14.2%	100.0%
	Children 12 yo and above	93	121	68	9	291
		32.0%	41.6%	23.4%	3.1%	100.0%
Hanoi	Household head	19	168	19	4	210
		9.0%	80.0%	9.0%	1.9%	100.0%
	Children 12 yo and above	9	292	77	5	383
		2.3%	76.2%	20.1%	1.3%	100.0%
Ho Chi Minh City	Household head	79	95	4	19	197
		40.1%	48.2%	2.0%	9.6%	100.0%
	Children 12 yo and above	76	228	32	4	340
		22.4%	67.1%	9.4%	1.2%	100.0%
Phnom Penh	Household head	102	51	2	43	198
		51.5%	25.8%	1.0%	21.7%	100.0%
	Children 12 yo and above	243	122	12	45	422
		57.6%	28.9%	2.8%	10.7%	100.0%

a. % within rows

Table 22 Comparison between the educational levels of household heads and children above 12 yo

In the case of Mr Booncherd, a skilful and innovative farmer in Nonthaburi, among his siblings only those who do not possess higher education (i.e. they have finished college) have stayed behind to work with him on the land. Others are

engaged in white collar occupations in the city. This shift of family labour into more attractive (socially) and more remunerative alternative occupations has created a labour void which, while partially filled through the substitution of labour for capital in the form of mechanisation, nonetheless requires the employment of non-family wage labour. In Lumsai, for example, some big catfish producers use migrant labour from Burma to work in their farms.

Third, it seems that fish production generally employs relatively more hired labour than aquatic plant production, although in HCMC the difference is not as marked as in the other three cities. We suspect this reflects the greater complexity of activities involved in fish production (preparing and maintaining ponds, sourcing wet food, preparing feeds, feeding, harvesting, and so on) and the generally higher level of commercialisation. As noted above, aquatic vegetable production at a certain level, for example at the household, is more malleable and can be built around the competing demands on household labour, and particularly the demands on women. But malleability is likely to diminish as the system commercialises due to the regular demand of cropping a large area and immediate marketing of the produce as leaving the vegetable too long in the field decreases its marketability. That said, fish production, however, is still more sensitive to variations in labour input therefore requiring the hiring of labour to meet any shortfall.

City	Categories of production systems	N	Min	Max	Mean	SD
Bangkok	Aquatic plants	112	1.25	6.25	2.8895	.90633
	Fish	88	1.25	5.00	4.4830	.90162
Hanoi	Aquatic plants	48	.33	3.33	1.7167	.71704
	Fish	80	.33	4.00	1.8286	.75761
Ho Chi Minh City	Aquatic plants	58	.30	3.33	1.5445	.60665
	Fish	31	.70	4.00	2.1152	.82682
Phnom Penh	Aquatic plants	157	.60	7.50	1.7849	.84658
	Fish	94	.33	5.00	.8586	.51247

Table 23 Daily wage rates in USD

In terms of wage rates for hired labour, workers in fish production are paid significantly more than those employed in aquatic plant production, with the exception of Phnom Penh (Table 23 and Figure 5). This may be due to the level of expertise needed in fish production, which tends to be more specialised, and therefore has ramifications on the nature of its labour market. We imagine that work needed in aquatic production is not as technically demanding as that of fish production. For instance, certain species of fish needs different ways of stocking and feeding whereas aquatic plants especially morning glory where hired labour is only used is easier and most of the labour is hired during the preparation of the field, planting, and harvesting.

However if we graph the daily wage rates across the different months they were collected, there are some significant seasonal variations in wage rates (Figure 5). Whether this is linked to seasonal patterns of demand for labour in the different production systems or to other factors influencing the demand/supply and therefore

the cost of labour cannot be ascertained. It may be that other factors influence the seasonal supply of labour such as, for example, flows of temporary migrants from the countryside linked to labour demands in rice agriculture.

Wage rates in Hanoi and HCMC show a different periodicity (Figure 5) which likely reflects different patterns of seasonal labour demand in these two cities and their surrounding rural areas. In Phnom Penh, there is a small increase in wage rates between November and December. The festivities of these months, which mark the rice harvest and the end of the rice cultivating season, may account for this. As already noted earlier, Bangkok has significantly higher average wage rates than the other cities. There also seems to be an increase in daily wage rates from May to July. Competition from other occupational sectors for hired labour may explain this.

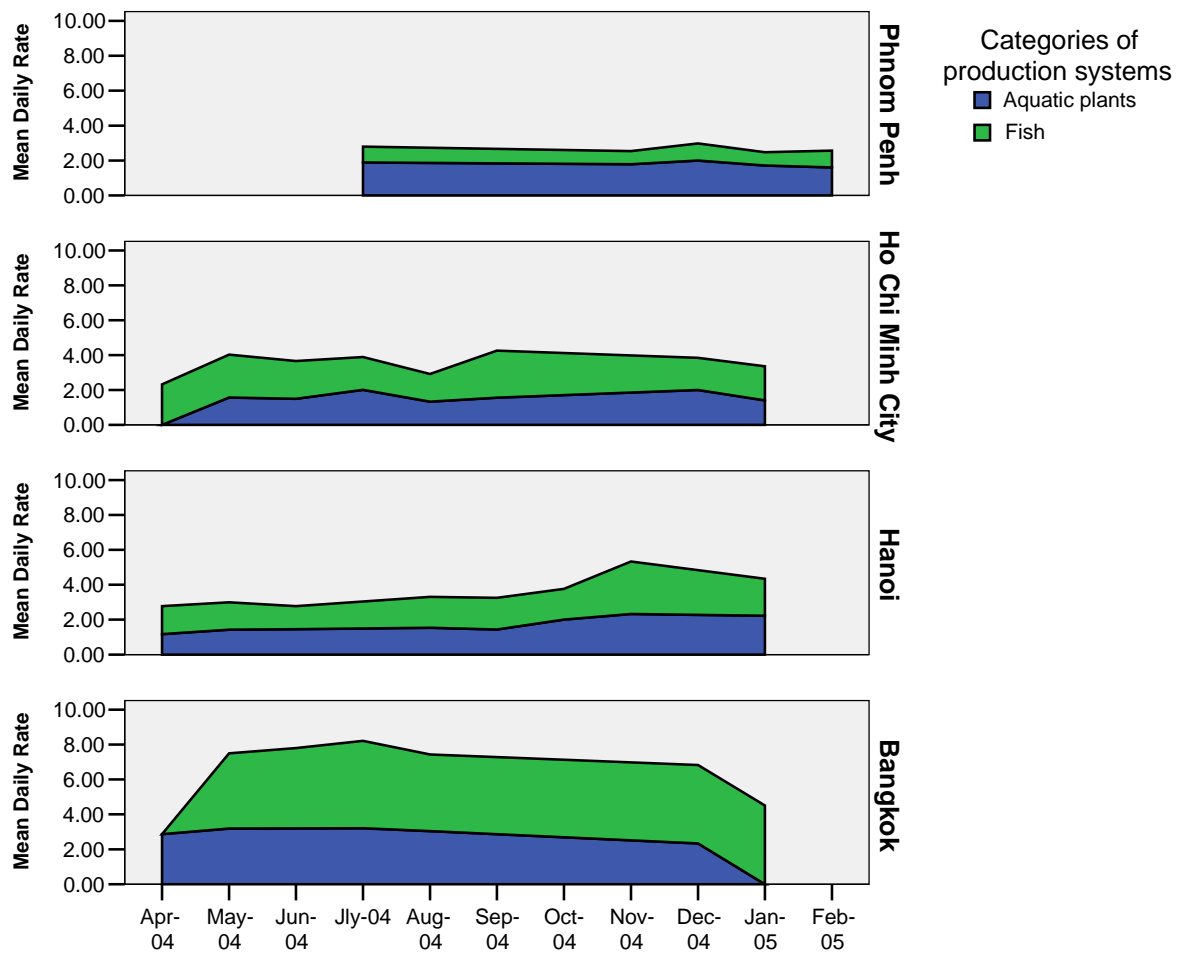


Figure 5 Mean daily wage rate

12 Kinship as pathways of livelihood uptake

Although kinship networks do not necessarily provide a universal pathway for the uptake of AFPS in all cities in this study, it appears to play an important role in

certain areas, and with some ethnic and religious groups. Using kinship cards, key informants were asked to identify each of the survey respondents in the baseline in terms of their familial relationships. An interesting picture emerges from Suanprixthai, an area of water mimosa culture. In the sub-district two Muslim Thai villages, Moo 1 and Moo 7, specialise in the production of water mimosa and they appear to be connected to two lineages. One of these lineages is shown in Figure 6.

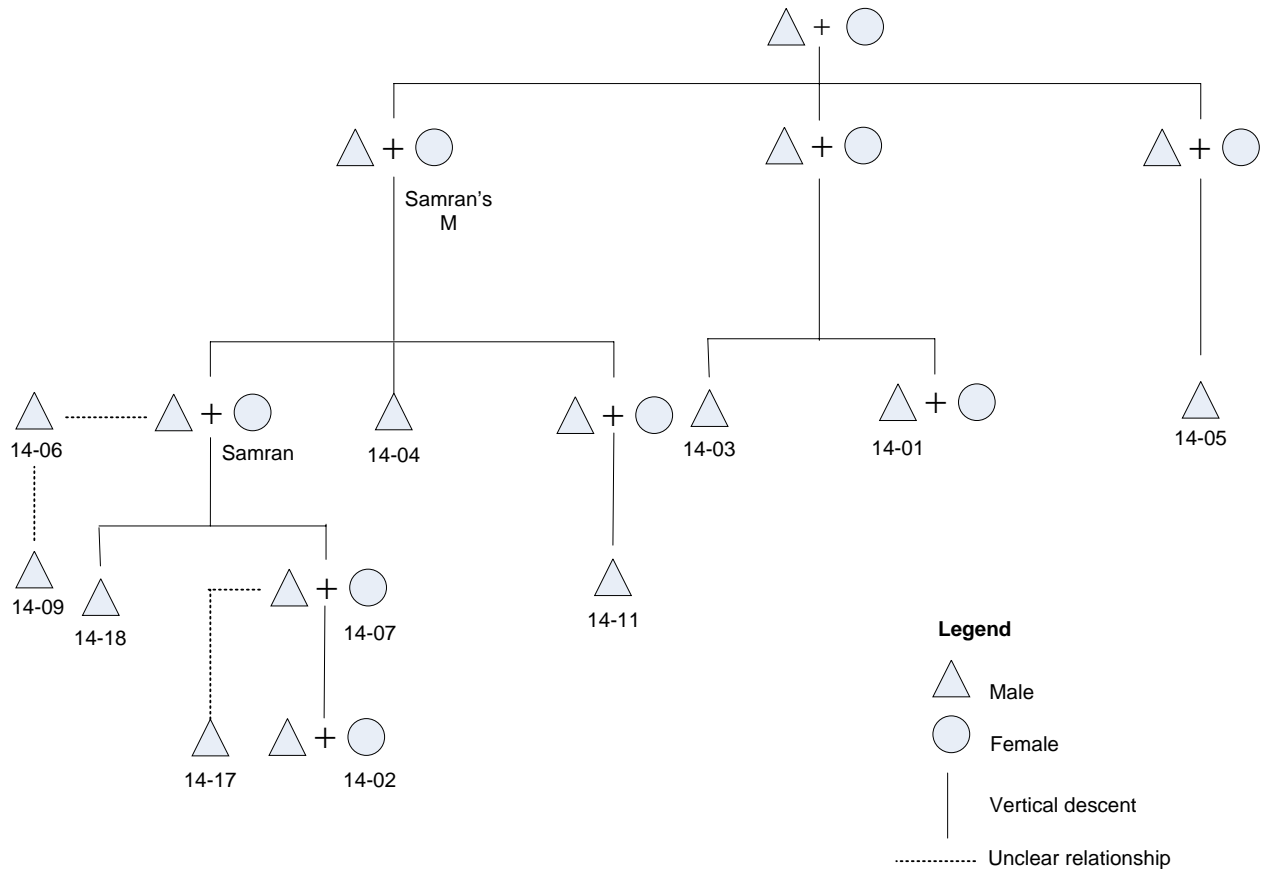


Figure 6 Kinship map among respondents in Moo 1, Suanprixthai, Pathumthani, Thailand⁹

In Moo 1, 11 out of 18 interviewed households were related by blood. In Moo 7 the figures were 13 out of 32 interviewed households. Since access to plots for water mimosa production is restricted to those households located immediately next to the canal (Chiang Rak Canal), sizes of plots are measured according to the length of the occupied frontage. This also has a further implication, which is to make entry difficult, perhaps impossible, for those who cannot claim access through long-term occupation. In the cases of Moo 1 and Moo 7, the current inhabitants can trace their lineage back to the original Muslim population who were resettled here from Pattani during the reign of King Rama 4¹⁰. In comparison, other cities – and especially Hanoi and Phnom Penh – have only horizontal relationships defined in terms of siblings or children. There appear to be no kinship relationships that can be traced across several generations such as there is in Suanprixthai. The religion of

⁹ This based on interviews with Samran.

¹⁰ Rama IV, King Mongkut, reigned from 1851 to 1868 (Wyatt 1984).

households in Suanprixthai explains in part such closeness. The very low level of inter-marriage between local Muslims and Buddhists means that the sharp association of the production system with a particular religious group has been noticeably resilient over some 150 years. By staying close together and maintaining strong kin ties, the practise of Islam is sustained despite being in a predominantly Buddhist country. It means, furthermore, that in these two communities there is also a tight association between religious affiliation and a production system.

The implication of a kinship network such as this in terms of its relationship with the production system is that access to the system within state-controlled waterbodies, such as irrigation canals, is limited to those who are in the network, i.e. other family members. This means that water mimosa will continue to be grown by current producers within Suanprixthai for a long as certain factors remain in place. First, that there are members of the household or kin networks who are willing to work in the fields; second, that the market demand remains strong and the systems remain profitable; and third, that such work remains the preferred activity among female household members.

13 Conclusion

In our earlier discussions of the households involved in AFPS (for example, Rigg and Salamanca 2004, 2005), we set out a range of ways that we hypothesised aquatic production systems in peri-urban spaces might develop. The table summarising the various positions is reproduced here for reference (Table 24). In this table, we took three different analytical positions or viewpoints: the peri-urban space; the aquatic food producer; and the aquatic food production system. The question that follows is: How far has the data collected and further analysis undertaken since that time led us to develop or revise those views and perspectives?

Angles and lenses	View
A fixed area of peri-urban space	Aquatic food production is squeezed out by an advancing urban frontier, emerging conflicts between land uses and activities, and new planning guidelines that hinder aquatic production. Remnant systems may persist.
Aquatic food producing household 1	Cultural change, manifested most strongly at the generational level, coupled with growing difficulties of making a living in aquatic production (pollution, rising land prices, new planning controls...) forces the household to shift into new livelihoods and sell a portion of their land. They continue to occupy a portion of their former farm, but it is a farm no longer.
Aquatic food producing household 2	Cultural change, manifested most strongly at the generational level, coupled with growing difficulties of making a living in aquatic production (pollution, rising land prices, new planning controls...) forces the household to sell their land and move to a new location where they are able to establish themselves as aquatic producers anew.
Aquatic food production system	The advancing urban core, and the economic (high costs of labour, rising land prices), environmental (pollution, conflicts with other activities), legislative (more coercive planning context), and cultural (changing working preferences among urban population) challenges associated with urbanization displaces the system outwards either progressively in a relatively smooth process of advance or as a leap over a

	considerable distance.
Advancing peri-urban zone	The peri-urban zone, with its component aquatic food production systems, advances outwards in line with urban development. Changes reflect other factors: new technologies, changing dietary preferences; competition from other areas and countries; and the changing structure of the aquatic food production system, for example.

Table 24 Hypothetical stages of transition in peri-urban aquatic food productions systems

To start with aquatic food producers, or rather aquatic food producing households, there are differences between as well as within the research sites. The Phnom Penh households stand out as more turbulent and, one is tempted to say, less mature and settled than those in the other three cities. Household heads are younger, settlement is more recent, and in- and out-migration are more pronounced. This is partly because the Phnom Penh peri-urban space is less regulated but also because Cambodia is still recovering from a long period of great instability. The question - and this cannot yet be adequately answered - is whether Phnom Penh will take on characteristics closer to those of the other cities as AFPS become embedded in peri-urban spaces and as the institutional context is firmed-up, or whether they will adopt their own agrarian transition pathway. One reason to doubt a generalised teleology is the strong sense that AFPS are not 'passed down' from one generation to the next in a tight, channelled fashion. Given the knowledge intensity of at least some systems, we were expecting to find a degree of specialisation, with one generation 'inheriting' AFPS from their forebears. Yet it seems that inherited knowledge is not particularly important and AFPS can be seen as livelihoods niches embraced for opportunistic reasons. This leads us to suggest, as indicated earlier, that we should not expect AFPS to survive in peri-urban spaces simply due to inertia or because they are viewed as somehow 'appropriate' to the peri-urban zone. Households move into and out of AFPS on a regular basis as called for in their livelihood contexts.

This takes us onto the issue of the resilience and sustainability of the systems themselves. There are three points to make here. First of all, AFPS cannot and should not be viewed in isolation. It is clear that most households maintain a diverse portfolio of livelihood activities of which AFPS are only one, albeit a major one. We sense - and for it to be otherwise would be surprising - that AFPS survive because they remain profitable, not because of some pre-ordained right. There are, however, two further reasons why households currently engaged in AFPS might not be so in the future. One - and this is the second point - is because the children of AFPS producers, to a surprising degree, would seem to want to avoid making a living in aquatic production. Of course other producers may enter the fray and take up where existing families have pulled out. If this happens then we might find a certain continuity of AFPS in peri-urban spaces even if the households that engage in the work are being constantly renewed. To put it more simply: while AFPS may have some resilience and continuity the individuals and households who populate the systems do not.

This brings us onto another point, which relocates the frame of reference from the household and the system to the peri-urban zone. It is clear that even should AFPS remain relatively profitable they may be squeezed out by a combination of a failure by government to recognise such systems as important and

legitimate activities in the peri-urban zone, and the pressures that are arising from urban development and sprawl.

So, what can we say overall, and in a preliminary manner? Before trying to pick out some general statements, it is necessary to acknowledge the diversity of systems and experiences across the four cities. Simple answers will simplify what is always contingent. Be that as it may, we have two wider points to make. First, AFPS exist within complex household settings where they often operate as one livelihood activity among several. Thus the future of AFPS will depend not on the systems themselves and in isolation, but on how they interrelate to other aspects of people's lives, both economic and non-economic. It is significant that this has come through in the survey data notwithstanding the fact that we followed a sampling protocol which selected AFPS producers and therefore privileged an AFPS-centric viewpoint.

The second general point is that while AFPS will, in all likelihood, continue to exist so long as there is demand for their outputs, where those systems are situated (spatially), who populates the systems, and how the systems operate could all change quite dramatically. The future of AFPS will depend on the sorts of factors touched on in this report: planning constraints in the peri-urban region; environmental conflicts associated with urban growth; the presence of alternative occupations and opportunities; and the relative profitability of AFPS.

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16 Appendix

City	Production Systems		N	Mean	Std. Deviation
Bangkok	Aquatic plants	Total person-days for hired labour	196	3.56	7.553
		Total person-days family labour	196	3.1990	2.94152
	Fish	Total person-days for hired labour	211	3.64	3.388
		Total person-days family labour	211	5.2133	3.00428
Hanoi	Aquatic plants	Total person-days for hired labour	596	1.02	4.806
		Total person-days family labour	596	10.5419	5.68234
	Fish	Total person-days for hired labour	466	3.56	11.147
		Total person-days family labour	466	12.3734	5.08149
Ho Chi Minh City	Aquatic plants	Total person-days for hired labour	317	1.23	2.648
		Total person-days family labour	317	6.8580	3.75458
	Fish	Total person-days for hired labour	355	.48	1.661
		Total person-days family labour	355	6.7183	1.07334
Phnom Penh	Aquatic plants	Total person-days for hired labour	371	1.50	2.097
		Total person-days family labour	371	6.0647	1.64436
	Fish	Total person-days for hired labour	205	3.15	3.468
		Total person-days family labour	205	6.4439	1.14747

Appendix 1 Mean of types of labour use