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Production in aquatic peri-urban systems in southeast Asia

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PAPUSSA

Production in Aquatic Peri-Urban Systems in Southeast Asia

Contract number : **ICA4-CT-2002-10020**

TITLE : PRODUCTION IN AQUATIC PERI-URBAN SYSTEMS IN SOUTHEAST ASIA

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Glossary

Acronyms and terms

AIT	Asian Institute of Technology, Bangkok
KU	Kasetsart University, Bangkok
KVL	Kgl. Veterinær-og Landbohøjskole
NIHE	National Institute of Hygiene and Epidemiology, Hanoi
PAPUSSA	Production in Aquatic Peri-Urban Systems in Southeast Asia
PAFPS	peri-urban aquatic food production systems
PCA	participatory community assessment
PI	Principle Investigator
PS	production system
PU	peri-urban
PUI	peri-urban interface
RIA1	Research Institute for Aquaculture No. 1, Hanoi
RRA	rapid rural appraisal
RUA	Royal University of Agriculture, Phnom Penh
SOS	State of the System
UAF	University of Agriculture and Forestry, Ho Chi Minh City
UD	University of Durham, UK
UOS	University of Stirling, UK

Contents

1. Introductions

The meeting was opened on Sunday 14th December 2003 with a welcome address by Professor Cam of NIHE (the hosts of the meeting) followed by introductions of all of the participants present. The meeting included not only the PI's from each of the participating partners but also a number of junior staff who had been involved in much of the initial survey work and analysis during the first year of the project. An agenda was proposed, outlined and circulated followed by a brief description of the objectives of the 2 day meeting.

2. Review of Meetings Objectives

Dr David Little (Stirling) gave a brief overview of the first years activities and achievements of the project leading up to the recently completed 4 State of the System (SOS) Workshops in Bangkok, Phnom Penh, HCMC and Hanoi, respectively. He then went on to describe how the outputs from this first years research would be used to determine and feed into the agenda and structure for work packages 2, 3 and 4 next year. The overall objectives of this P & P meeting were described and are listed below.

- Overall to use the meeting as a joint forum for discussion and preparation of all of the partners for WP2, 3 and 4 next year.

- Each of the five city partners (KU, RUA, UAF, and RIA1/NIHE) to present, disseminate and share overview presentations of their research and findings from the first years work culminating in the State of Systems(SOS) Workshops in their respective cities.

- The six PhD students to present a summary of their proposed areas of study and research in relation to the overall objectives and aims of the PAPUSSA project.

- To jointly discuss, collate and interpret the overall findings from Work Package 1 for each city partner, in order to go on and set up and implement a co-ordinated framework for the more detailed communities/household monitoring (questionnaire) phase of the projects next phase - WP's 2, 3, and 4 in 2004.

- More specifically for each city partner to have identified those specific peri-urban communities which they will be working with and monitoring next year in WP's 2, 3, and 4.

- By the meetings close to have proposed and agreed upon a draft workplan for 2004.

- Throughout the 2 days of the meeting to have improved and developed the overall communication and co-ordination between each of the partners leading to an effective and structured approach to next years work packages.

3. Outcomes of the State of the System (SOS) Meetings in Bangkok, Phnom Penh, Ho Chi Minh City and Hanoi.

Outcomes and findings of the SOS meetings carried out by each of the four city partners at the end of the first year (WP1) were presented to the meeting and can be viewed in Appendix 3; brief summaries of the presentations are presented below.

3.1 Bangkok

Dr Ruangvit Yoonpundh from Kasetsart University presented the findings from his group, shown in Appendix 3a. Following an overview of aquatic farming systems present in peri-urban Bangkok, Thailand the methodology employed in the Participatory Community Appraisal (PCA) was outlined and findings described. Examples of community mapping, timelines, seasonal calendars, activity matrix, resources mapping and problem ranking were presented and discussed. Outcomes were summarised and general conclusions presented.

3.2 Phnom Penh

Mr Chhouk Borin from the Royal University of Agriculture gave a presentation on progress in researching peri-urban aquatic farming systems in Phnom Penh, Cambodia (Appendix 3b). Institutions with a stake in planning and managing peri-urban activities were reviewed. The objectives and methodology adopted for the PCA were outlined and examples of resources and community mapping, timelines, seasonal calendars, an activity matrix and problem ranking descried. Approaches employed in the marketing appraisal were discussed and an overview of the marketing network shown. Aquatic plant sales account for over half the total sales of vegetables in the city and although people prefer wild fish, poorer people in urban areas cannot afford to buy them and consequently they rely on lower priced fish cultured in peri-urban areas. The composition of participants that attended the SOS meeting was outlined and findings from research needs and action points identified by local officers, producers, market actors and institutional representatives were presented.

3.3 Ho Chi Minh City

Dr Hung from the University of Agriculture and Forestry gave a presentation concerning the status of aquatic production systems in peri-urban areas of Ho Chi Minh City, Vietnam (Appendix 3c). Major farming systems identified included fish farming in ponds, rice fields and cages and aquatic plant (morning glory, mimosa, lotus and duckweed) production. A schematic diagram showing the relationships between institutions with a role in developing PAFPS was presented, and the position of a development project in this framework was discussed. The role of PCA in understanding the production systems and livelihoods of people in 4 peri-urban communities was discussed and findings reviewed. The markets and distribution networks for fish and plants cultured in peri-urban areas were described and prices throughout the market chain compared. Prices paid by the consumer for fish are commonly 1.5-2 times that received by the farmer, in the case of aquatic plants, consumers pay 5-6 times that paid to the producer. Outcomes of the SOS

workshop, attended by 33 stakeholders, were also reviewed, including the validation of research results, filling knowledge gaps, clarification of important points and defining the research and action agenda for the next project phase.

3.4 Hanoi

Dr Tuan from the Research Institute for Aquaculture No. 1 presented a summary of activities undertaken as part of the situation analysis, namely a review of aquatic farming systems, an institutional assessment, PCA and marketing survey. An organisational diagram showing the relationship of institutions in Hanoi to producers was presented, as were diagrams depicting the relationship between institutions involved in urban planning and producers, and institutions responsible for fisheries development and producers. The types of production systems present in peri-urban Hanoi were described and the productivity and area occupied by each discussed. Fish seed, fish and shrimp production in sewage-fed ponds, VAC systems, urban lakes and aquatic plant production systems were shown in detail. Marketing channels for fish and aquatic plants were described and the relative importance of differing urban areas in supplying fish and aquatic plants outlined. PCA activities in Dong My, Duc Tu, Hoang Liet and Tran Phu were reviewed; an example of a timeline and outcomes of a problem identification activity were presented. Finally, action and research needs expressed by SOS participants were described, notably the need for extension, loans, wastewater treatment, safe fish and vegetable production and new markets and high value products.

4. Workshop sessions

4.1. Risk assessment

The assessment of risks associated with PAFPS in each of the cities was undertaken in groups, members of which had a particular knowledge of the systems in question. Participants were requested to consider the nature of production systems present around the city and the risks associated with producing, marketing and consuming products from each. Outcomes for Phnom Penh are summarised in Table 4.1, during fish production risks include mortality, floods, predation and problems with water quality, in the case of vegetable production possible contamination and poisoning with pesticides and heavy metals were regarded as potential risks. Various health risks including skin irritation, blood infection, rheumatism, flu and faecal contamination were identified for general aquatic production. Considering marketing, price fluctuations, surplus production and consumer perceptions were regarded as risks for both plant and fish production. To avoid problems with negative consumer perceptions it was reported that some producers mix fish grown in wastewater with others from different production systems (Borin). Additional risks associated with marketing vegetables included market information, transportation, packaging and quality, although details of the particular problems envisaged were not reported. A general health problem identified for aquatic products grown in peri-urban areas was the possible 'export' of disease problems when products leave the city; William Leschen had also identified this issue as a possible theme for inclusion in his PhD studies (Section 5). Regarding consumption, possible contamination with parasites and pesticides were identified as specific risks for fish and vegetable production, respectively, whilst risks associated with consuming aquatic products in general included possible contamination with industrial pollutants and faecal matter, and potential health risks associated with integrated production of pigs and poultry with aquatic systems.

Table 4.1. Risks associated with producing, marketing and consuming products from PAFPS in Phnom Penh.

Product	**Production**	**Marketing**	**Consumption**
Fish specific	Mortality Loss during floods Loose fingerlings to predation by snakehead Unstable yield due to unreliable water quality	Price fluctuation Surplus product Consumer perception – overhung latrine Spp reference (hybrid catfish, pangasius)	Raw/cooked? Do consumers differentiate Fish borne parasites Accumulation of toxic chemicals
Vegetable Specific	Pesticide poisoning of natural resources - used directly or indirectly by consumer eg mussel, snail, wild fish; risk to user from spraying or nutrient supplement	+ Market Information + transportation Surplus Packaging Price Fluctuation Quality Consumer perception	Pesticide burden
General Aquatic Products	Occupation health hazards in general Skin irritation Blood infection Rheumatism Flu Direct Faecal	Disease "exported" when product leaves the city to province	Faecal contamination (direct/indirect); parasite infection; poisoning by heavy metal & industrial contaminants; transmission of zoonotic pathogens in integrated pig/poultry and PAFPS.

Risks associated with vegetable and fish production in peri-urban Bangkok are summarised in Table 4.2. For morning glory the main risks to production were the high cost of production and low market price, for water mimosa sensitivity to pests and diseases was identified as an important risk factor. For marketing the low price received by farmers for both morning glory and water mimosa was considered a risk, commercial farmers being contracted to sell only in big markets, significant changes in supply and demand and faecal contamination at the market were also considered as important risks to vegetable marketing. Accumulation of pesticides, heavy metals and herbicides were mentioned as possible risks from consuming aquatic vegetables. Considering fish culture the high and variable cost of feed was considered a possible risk associated with production; for hybrid catfish disease in the cold season and poor water quality were identified as risks. Oversupply causing low prices was the main risk to marketing catfish, whilst feeding these fish with chicken processing by-products and the possible accumulation of antibiotics and hormones constituted risks associated with consumption.

Table 4.2. Risks associated with producing, marketing and consuming products from PAFPS in Bangkok

Products	**Production**	**Marketing**	**Consumption**
Morning Glory (Pak Bung)	Low market price – high production costs (fertilisers and chemicals)	Low price to farmer *Commercial farmers can only sell to big markets (Contracts) *Big changes in supply and demand. *Faecal contamination at market	Food safety (accumulation of pesticides and herbicides)
Water Mimosa (Pak Kached)	Non wastewater and wastewater Fertiliser + chemicals Clean products and get high market price (alum treated) Water mimosa is sensitive to pests and certain chemicals	Same as above *	As above
Hybrid catfish (Pra Duk Big Aui)	Non wastewater High and varying price of feed Diseases particularly in the cold season Poor water quality (limited water exchange)	High supply areas = low price	Feed with chicken waste - associated food safety. Accumulation of antibiotics/hormones in fish
Polyculture (mixed species) Different carps Tilapia	Non wastewater Relatively high feed costs - low price Recycling low value product to be fertiliser		

Green vegetable production in Hanoi is at risk from microbial, chemical and pesticide contamination and heavy metal accumulation, occupational health hazards and diseases associated with widespread wastewater reuse were also considered important risks (Table 4.3). Cross contamination was considered the only risk in the market place, whilst risks

associated with consumption included microbial infection and chemical contamination, gastro intestinal disease and food poisoning. Pesticides and fertiliser costs were considered the main risks associated with producing spice vegetables. For fish cultured in peri-urban areas of Hanoi the risk posed by liver flukes when eating raw fish were considered significant.

Table 4.3. Risks associated with producing, marketing and consuming products from PAFPS in Hanoi

Products	**Production**	**Marketing**	**Consumption**
Green Vegetables: Morning glory (Rau muong) Water dropwort (Rau can) Watercress (Rau cai xeong) Water mimosa (Rau rut)	Microbial contamination – faecal materials in wastewater Chemical contamination – heavy metal accumulation – pesticide uses More wastewater dependent Occupational diseases	Cross contamination	Food safety (Microbial and chemical infection) Gastro intestinal diseases, food poisoning.
Spice Vegetables Rau ram Rau ngo Ngo'sen (lotus)	Production cost (food pesticide, fertiliser)		
Fish/bivalve Catfish (tre) Snakehead (qua) Common carp (chep) Black carp (tram der) Tilapia (rophi) Silver carp (me)	 wastewater independent wastewater independent wastewater dependent wastewater dependent wastewater independent wastewater independent	High profits	Liver fluke (raw fish consumption) Accumulation of toxic chemicals

Risks associated with vegetable production in Ho Chi Minh City were similar for the main species considered (water morning glory, water dropwort and lotus), and included contamination with faecal matter, pesticides, chemicals and heavy metals and occupational health hazards. For marketing price fluctuations were regarded as risks for water morning glory and water dropwort sales, as was the seasonal nature of lotus availability. Risks associated with consumption of vegetables cultivated using wastewater were possible pesticide and chemical contamination, whilst the fact that some vegetables may be eaten raw was also highlighted. Risks associated with tilapia, common carp, catfish and Chinese and Indian major carp production were reportedly the same and consisted of losses during flooding and the possible impact of wastewater reuse on human health. Competition from fish produced outside of the city was identified as a risk in marketing tilapia, catfish and Chinese and Indian major carp. Consumption risks linked to all fish species were broadly similar, focusing mainly on possible contamination associated with wastewater reuse, although common carp consumption was also linked to a possible risk from liver fluke infection.

Table 4.4. Risks associated with production, marketing and consumption of products from PAFPS in Ho Chi Minh City

Product	**Production**	**Market**	**Consumption**
Water Morning Glory wastewater and non wastewater (Rau Muong)	Pesticide use wastewater contamination Heavy metals Health risk for producers	wastewater contamination price fluctuation	Pesticide and wastewater Impact on health Might be eaten raw
Water dropwort (only wastewater) (Rau nhut)	As above Seasonal??	As above	As above
Lotus (sen)	wastewater contamination Chemicals and heavy metals	Availability – seasonality	Health impact of waste and chemicals – eaten raw
Tilapia (Rophi) – wastewater and non wastewater	Production loss due to flooding wastewater impact on human health	Impact from production outside the city – price competition	Might be impacted by wastewater contamination
Common carp (Chep) – wastewater and non wastewater	Same as for tilapia		Heavy metal and liver fluke
Cat? Fish (Tre, Tra, Basa	Same as for tilapia	Competition from Mekong delta – consumption perceptions	Health impact on wastewater contaminations
Chinese carps Indian carp (Chep Trung Quoc, Troi An Do) – wastewater and non wastewater	Same as for tilapia	Same tilapia Competition price from other provinces	Same as for tilapia

Having reviewed the possible risks associated with vegetable and fish production, marketing and consumption a general risk schema was developed and evaluated through discussion amongst the meeting participants (Figure 4.1).

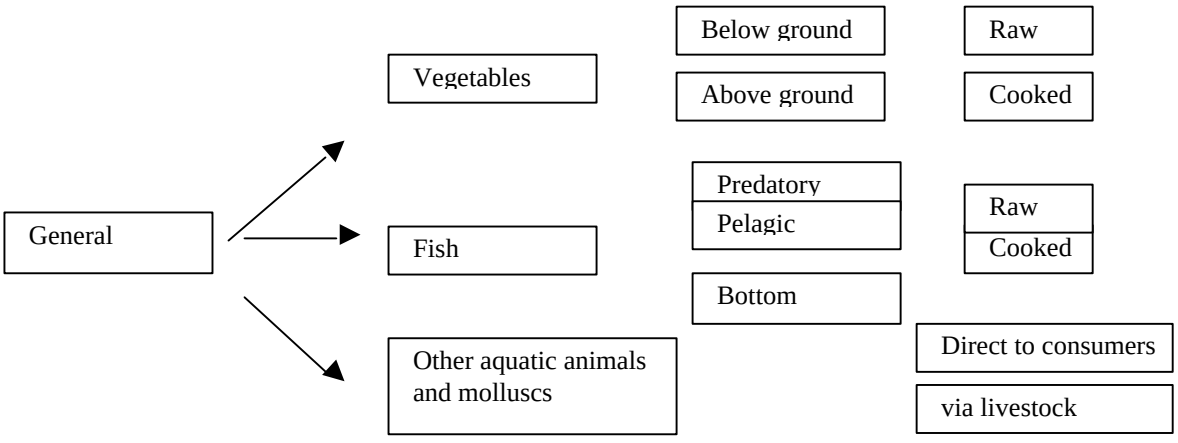

Figure 4.1. General risk schema for products cultured in peri-urban production systems

4.2. Poverty targeting

Based on an assessment of the production systems predominating in the four peri-urban areas under investigation in the current project, participants in this activity, who were grouped together based on a particular knowledge of the systems in question, were requested to identify which PAFPS benefited the poorest members of society. This assessment was further broadened to consider if and how poor people benefited from being involved in the production, marketing or consumption of the various products. Matrices were developed by each of the groups to summarise the outcomes of their deliberations.

For Phnom Penh it is apparent that poor and very poor people are engaged primarily in morning glory and water mimosa production, whilst fish production, both wastewater dependent and independent, is largely undertaken by the rich and medium rich (Table 4.5). Vegetable marketing is also largely the domain of the poor and very poor, whilst consumption by all sections of society, ranging from the rich to very poor was noted. In the case of lotus, marketing and consumption or use of different parts of the plant are important to different groups. For wastewater dependent fish production the rich and medium rich benefit from production, marketing and consumption, the poor and very poor are however employed in some aspects of production. Rich, medium rich and poor groups all benefit from wastewater independent fish production.

Throughout the year poor people in Hanoi are engaged in producing water morning glory, in the summer poor people produce mimosa and in the winter water dropwort, watercress and other miscellaneous plants (Table 4.6). Poor small-scale traders, most of who are women are largely engaged in marketing aquatic vegetables grown around the city. Mimosa and watercress are consumed by the medium rich and rich, whilst both rich and poor consume water morning glory, water dropwort and other miscellaneous plants. Fish culture in Hanoi, whether nursing, rice-fish, VAC or prawn culture is largely practiced by medium and rich groups, although poor men are engaged in wastewater aquaculture in small ponds and rice-fish culture in freshwater. Medium and rich groups mostly undertake marketing although there is some differentiation based on gender, with rich men largely responsible for wholesale marketing and medium rich women engaged in retailing. Consumption of fish grown using wastewater benefits poor people; all groups benefit from consuming fish from rice-fish and VAC systems, whilst rich people consume prawns.

Intermediately wealthy groups conduct aquatic vegetable production around Bangkok, although poor people may be employed for particular activities e.g. harvesting (Table 4.7). Men usually take on the role of middlemen in the marketing network, whilst women are frequently involved in retailing. Morning glory is considered an inexpensive vegetable and therefore is consumed by both rich and poor groups; mimosa is less common and usually served in restaurants to richer clientele. Fish producers in peri-urban Bangkok are considered wealthy, whilst some producers also engage in wholesaling. Catfish is consumed in middle class restaurants, whilst tilapia and fish produced in polyculture systems are cheaper and often found in restaurants and food stores accessible to poorer groups.

Poor men and women in Ho Chi Minh City are engaged in morning glory, mimosa and lotus production in wastewater-based systems[1], morning glory grown in this way is not marketed but fed to livestock and fish by the poor. Women are largely involved in the collection and retailing of mimosa and lotus, whilst these plants are sold to restaurants and people on higher incomes. Table 4.8 outlines the matrix for Ho Chi Minh City showing production systems and where poor people benefit in production, marketing and consumption. Morning glory grown independently of wastewater is produced by poor people, but instead of being used for livestock fodder is sold by female collectors and retailers to lower income groups for consumption. Considering wastewater dependent fish culture, poor men mainly undertake polyculture and integrated farming, whilst wealthier groups undertake seed production and monoculture. Production from all farming systems is transported by collectors and sold through wholesalers, fish from polyculture and integrated systems is sold mainly to poor people, whilst fish from monoculture are sold to those on higher incomes; seed are sold to all farmers, irrespective of wealth. Fish are also cultured under monoculture, polyculture and in integrated farming systems independently of wastewater. Poor men and women practice integrated farming, polycultue is undertaken by poor and better off men and women and monoculture by better off men and women. Produce is again transported by collectors and sold by wholesalers, and people on low incomes buy fish from integrated farming, restaurants and better off individuals buy fish from monoculture operations, and both high and low income groups buy fish produced under polyculture, although it is unclear if there is any difference in species purchased depending on relative wealth.

[1]Editorial comment (Anders Dalsgaard) - Just a thought: I remember having seen a number of ponds back in HCMC in 1997 culturing duckweed for both pig feed and feed for snail culture. Are these practices still important?

Table 4.5. Poverty targeting with respect to production, marketing and consumption of products from PAFPS in Phnom Penh

Aquatic Product	Production	Marketing	Consumption
I. Aquatic plants			
1. Morning glory (WD & WI) in lakes	Producers: poor, very poor Some medium households also produce morning glory. Very important to the very poor group (men & women are involved)	Market actors: poor, very poor (produce and bring to the market themselves) Women bring the morning glory to market	Rich, medium, poor & very poor (rich and medium bring mostly to pig)
2. Lotus (WD & WI) in lakes	Producers: Medium and poor (have ability to buy lotus seed and rent the land for growing) important source of income for both. (men grow the lotus)	Medium, poor & very poor Medium and poor produce and bring to market themselves but very poor collect wild lotus and buy lotus leaves, or flower from producer to market, very poor earn their living from this activity	Rich & medium use for home consumption and they eat root lotus. The poor and very poor use lotus leaves for packaging.
3. Water mimosa (WD only) in lakes	Medium, poor & very poor They produce to market. Men and women are involved. Receive a higher price than for morning glory but difficult to grow and they spend a lot of money (high investment)	Medium ,poor and very poor They sell mimosa themselves (women)	Rich, Medium, poor & very poor use for home consumption
II. Fish – WD 1. Pangasius 2. Walking catfish 3. PO (in pond / pen culture)	Rich & medium (medium >> rich) Both hire the poor and very poor (labour) when culturing fish in a pond. It is important income.	Rich and medium produce and sell to the market. Sometimes middlemen come to collect their fish. The market price is lower than for fish from WI systems.	All the people use but the poor and very poor rarely have the money to buy.
Fish – WI 1. Tilapia 2. Pangasius 3. Catfish 4. Common carp, etc … (Ponds, along river, cages)	Rich, medium & poor The poor could manage small pond. Important income. For poor important food.	Rich, medium & poor. Poor sell small amounts to the market. They bring it themselves to the market, but for the rich & medium, middlemen come to collect from their farms.	All, but the poor keep more and process it for use in the home. People like it and it is more popular than fish from WD systems.

Note: WD – wastewater dependent; WI wastewater independent

Table 4.6. Poverty targeting with respect to production, marketing and consumption of products from PAFPS in Hanoi

Aquatic Product	Production	Marketing	Consumption
Aquatic vegetables		(mostly by women)	
Water morning glory	Popular by poor through year (1)	Small scale traders (<1.5)	Consumed commonly by the poor & some for pigs (1-3)
Mimosa	Poor people in summer (<2)	Small-scale traders (<2)	Less commonly (2-3)
Water dropwort	Poor people in winter (1.5)	Small-scale traders (<2)	Normally (1-3)
Water cress	Poor people in winter (<2)	Small-scale traders (<2)	Less commonly (2-3)
Others	Poor people in winter (1.5)	Small-scale traders (<2)	Less commonly (1-3)
Fish systems	(mostly men)	(men)	
Nursing	Fish farmers have an experiment (2-3)	Use mainly for themselves and sell a little to traders (2)	
Fish culture in wastewater	Rich men (large area) employ poor men (4) Poor men (small area) (1.5)	Male wholesaler (3), female retailer (2), male middlemen (2) – overall (1)	Poor people in farm area (1)
Rice-fish	Lowland areas – rich men (2) poor men (1) (Freshwater)	As above (overall 2)	Commonly (1-3)
VAC (FW + WASTEWATER)	Normal farmers (2)	As above (overall 2)	Commonly (1-3)
Prawn culture	Only freshwater, rich people (3)	Wholesaler, restaurant (3+)	Rich people (3)

Table 4.7 .Poverty targeting with respect to production, marketing and consumption of products from PAFPS in Bangkok

Aquatic Product	Production	Marketing	Consumption
Aquatic vegetables (WASTEWATER Independent)			
Morning glory (Pak Bong)	Majority of producers are better off intermediate (own and rent) Poorer group are employed for particular activities (e.g. harvesting) They don't own land (mostly rent)	Low prices for products in combination with high costs Marketing chain is going to be shorter. Traders said that, from producers – retailers and consumers.	Morning glory in an inexpensive vegetable. A common vegetable for the Thais either rich or poor. It appears in a wide range of recipes.
Mimosa (Pak Ka-Shed)	Land price is varied from 1-4 million Baht/rai (1600 m2)		Mimosa is not as common as morning glory. This vegetable is mainly served in the restaurant. Seems to be the better off who buy it.
	Main production areas for these two types of vegetable are in the peri-urban of Bangkok. They require a particular type of conservation irrigation system, which is very rare in other parts of the country. Normally family labour is utilised (both men and women), whilst extra is hired when necessary	Due to a good transportation network these 2 types of vegetable are transported to most parts of the country. Retailers are mostly female, whilst male partners are mostly playing the part of middlemen.	
Fish (wastewater independent)			
Catfish Tilapia Polyculture	Producers are rich people. It needs intensive culture systems (high price of feed and other input costs) Land price is about 1-4 million Bhat/rai Poorer people are employed to help in feeding and harvesting. Most labour used is family labour (both men and women). Extra labour is hired when necessary. Although input costs for tilapia and polyculture are lower than for catfish, producers are not poorer (in relation to high value of land price)	Prices fluctuate more than for vegetables (by season) High input cost is a major problem when compared to the low price of fish. Some producers are wholesalers. Although input costs are lower for tilapia and polyculture prices are not satisfactory. The number of men involved in wholesale and middleman role is higher than retailers.	Catfish is more common in middleclass restaurants than normal kitchen. Tilapia and polyculture are cheaper than catfish, and fish produced here is commonly found in lower calls restaurants and food store.

Table 4.8. Poverty targeting with respect to production, marketing and consumption of products from PAFPS in Ho Chi Minh City

Aquatic Product	Production	Marketing	Consumption
Aquatic plants (WASTEWATER)			
Morning glory	Supplied to livestock and fish by poor people	Don't sell this in the market	No human consumption
Mimosa	By poor person, including both men and women (production becoming more common)	Collector and vendor (mainly women) and retailers & mobile trader (all women)	Restaurant people (all women) and those on higher incomes (few poor people)
Lotus	By poor people, including both men and women (production becoming more common). Mainly produced in rainy season	Collector and vendor (mainly women) and retailers & mobile trader (all women)	Mainly restaurants and rich people
WI			
Morning glory	By poor person, including both men and women (production becoming more common)	Collector and vendor (mainly women) and retailers & mobile trader (all women)	Mainly lower income groups
Lotus	By poor person, including both men and women (production becoming more common)	Collector and vendor (mainly women) and retailers & mobile trader (all women)	Mainly restaurants and rich people
Fish (WD)			
Polyculture	Mainly poor people (mainly men); fish is culture year round	Collectors, wholesalers (all men)	Mainly poor people
Monoculture	mainly better off people (all men), no labour is hired	Collectors, wholesalers (all men)	Mainly those on higher incomes
Seed production	mainly better off men, they hire around 2-3 labourers (when they sell seed fish)	Collectors, wholesalers (all men)	All fish farmers
Integrated farming (rice-fish, livestock-fish)	Mainly poor people (mainly men)	Collectors, wholesalers (all men)	Mainly lower income
Fish (WI)			

Monoculture	Mainly better off men and women (no labour is hired)	Collectors, wholesalers (all men)	Restaurants and better off people
Integrated farming (livestock-fish)	Poor people (men & mainly women)	Collectors, wholesalers (all men)	Lower income people
Polyculture	Poor and better off (men and women)	Collectors, wholesalers (all men)	Both high and low income people

4.3. Research and action agendas

The partners were divided into their respective city groups each of which also included participants from Stirling, Durham, AIT, and KVL and given 40 minutes to carry out the activity below.

The objective of this session was for each city partner to take the findings from the respective action and research agendas prioritised by the four groups of stakeholders (Producers, Markets, Local Officers, and Senior Officers) present at the SOS meetings, and where possible correlate or match them up to the contents and overall objectives of the different Work Packages within years 2 and 3 of the PAPUSSA project listed below.

Public Health and Hygiene Monitoring/Pilot	WP2/WP5
Production System and Livelihoods Monitoring/Pilot	WP3/WP6
Social, Policy, and Institutional Monitoring/Pilot	WP4/WP7
Dissemination and Feedback of Information	WP8

Findings from the Hanoi SOS meeting suggest that the stakeholders present primarily saw the priorities of Action (Intervention) and Research to be within the areas of WP2 and WP3 - i.e. Public Health and Hygiene, and Production Systems and Livelihoods and interestingly not within Social, Policy and Institutional Areas (Table 4.9). Many of the Action Agendas mentioned involve giving increased training or knowledge to those directly working in peri-urban aquatic production systems, not just in their production techniques but also on the impact and safe use of pesticides associated with the peri-urban aquatic environment.

The Ho Chi Minh group in their SOS meeting divided up the stakeholders present into 3 groups, putting Local and Senior level Officials together into one group, hence there are 3 categories of stakeholder listed (Table 4.10). Pesticide use, its regulation and monitoring again came out as an important priority for both the Producers and Market related stakeholders groups with Health concerns also mentioned. The overall management and treatment of waste water (both sewage and industrial) in Ho Chi Minh City was also a priority for the Producer and Local/Senior Officers Group whilst the Markets Group concentrated more on countering the (detrimental) effects of price variations of their products – an area which is in reality outside the scope of this project. The Local/Senior Officers group also prioritised the need for more dissemination of information on the city's future housing/land development plans to those peri-urban communities and farmers whose livelihoods are and will be threatened.

Table 4.9. Comparison of Action & Research agendas from the Hanoi SOS meeting and objectives outlined in the PAPUSSA proposal

Aquatic Product	Producers		Local officials		Market traders		Senior-officers	
	Action	**Research**	**Action**	**Research**	**Action**	**Research**	**Action**	**Research**
WP2								
O1	To limit use of WASTEWATER from the city	To assess the quality of wastewater systems and find solution					To treat wastewater from factories & fish ponds by biological and chemical methods	
O2	To relax & reduce hard work; to rent labour; to buy medicine for family and treat themselves				To provide information through the mass media (TV, radio, poster …) on the sage use of pesticides	To provide clear labelling for pesticide products		
WP 3								
O1					To create more water for farms	To provide longer contract on land for farming. To build fish seed centres at the community level & to open export market.		
O2	To borrow money from different sources To establish trading cooperative to market their products	To find sources of fund to develop production	To provide low interest loan over a period of time To establish as association among peers to help each other market their product	To research on more simple mechanisms to access of time To research on consumer perceptions of aquatic products				

O3	To provide an early forecast for the weather	To increase knowledge on aquaculture using the mass media	To research on reasonable techniques for each setting	To produce good fish seed and land lease for fish farming	To establish short and long term training courses for fish and vegetable including visiting modern farms	To improve the capacity of technician and farmers	To improve evaluation of status of aquaculture plants, fish in the peri-urban
O4		To provide technical on aquaculture	To increase farmers knowledge				To practice and apply new techniques of high quality fish seed
WP4							
O1						To treat wastewater from factories and fish ponds by biological and chemical methods	
O2			To research on consumer preferences for aquatic products				
WP8			No information				

Table 4.10. Comparison of Action & Research agendas from the Ho Chi Minh City SOS meeting and objectives outlined in the PAPUSSA proposal

Aquatic Product	Producers	Officials (Local & Senior Officials)	Market	
WP2				
O1			Acceptable limits of pesticide for vegetable; health impact of food from different waste related systems	
O2			Set up criteria for good safety	
WP 3				
O1	Content of wastewater Proper management of sewage water			
O3	Training on safe use of pesticides and disease prevention Cooperative of farmers to maximise profits	Study to set up appropriate technique for sewage loaded systems	Reduce affect of seasonal price variations; more production of mimosa and eliminating climbing perch to reduce price	
WP4				
O1	Industrial waste water well managed to prevent effecting production systems			
O3		Inform the housing plan Trajectories of development		Appropriate pricing systems
O4		Dyke construction; infrastructure construction; irrigation system		
O5				Ruler to reduce the price variation

The findings from the stakeholders at the Phnom Penh SOS meeting suggest that they see further research and actions necessary in the general areas of Health related to the re-use of the city's waste water by peri-urban communities, with more specifically skin irritation and diarrhoea mentioned. Both the producers and the local and senior officials seem to be very much aware and interested in the future possibilities for the further treatment/filtration of the city's waste water – this primarily relating to the two main plant and fish culturing lakes located in Phnom Penh. It should be noted that unfortunately there was no representative present from the JICA (wastewater) project despite invitations having been sent[2].

The markets and local officials stakeholders in Bangkok focussed most of their preferred research agendas on further studies in chemical and pesticide use in aquatic production systems, also relating this to the need to understand consumers' tastes and preferences (i.e. demand) in the markets for aquatic products originating from Bangkok. The producers were more concerned with issues relating to the production within their systems such as provision of fertiliser, monitoring of nearby industrial effluents and controlling golden cherry snails in canals.

The outcomes and findings from this activity were adversely affected by the methodology and findings from the original SOS meetings, in that it was not clear to some of the stakeholders present the distinction between "Action" and "Research" agendas. As a result, as can be seen from the tables above, there is a certain lack of definition between them. Relating to this there was also a lack of specificity in certain of the research agendas proposed, a generalisation which makes it harder for the project to make more positive and constructive recommendations towards the direction and areas which we will be concentrating on in the next two years work packages. However certain key points are evident in the research priorities common to the 4 cities – pesticide/chemical (mis)use, its regulation and monitoring – from the aquatic production systems right through to the market and then on to food safety and food preference issues related to the consumer. Health related research was prioritised in Phnom Penh and to a lesser extent Hanoi, with the increasing consumer and market awareness of food safety in Bangkok and Ho Chi Minh City being also directly connected to potential human health risks. In more broader terms the peri-urban aquatic environment, its monitoring and regulation, and also research into its ecology in relation to human interventions such as industrial pollution were also prioritised, with a particular emphasis being put on the need for better management of urban waste water especially in Ho Chi Minh City and Hanoi. In general there appeared to be more of an emphasis on action and research agendas related to WP2 (Health and Hygiene) and WP3 (Production Systems and Livelihoods) however there was a certain amount of cross over from both of these areas into the social and institutional focus of WP4. This exercise is worthwhile and provides interesting feedback but it should be noted that its findings should be viewed and qualified in conjunction with the range and representative nature of the stakeholders present at each of the original SOS workshops. From observations at the time there were several stakeholders present who tended to dominate the discussions and thus adversely affected the outcomes and prioritisations of the action and research agendas proposed.

[2] Editorial comment (Anders Dalsgaard) - If not already under way, I propose that Borin and colleagues follow up on the JICA project and get copies of project documents, etc.

Table 4.11. Comparison of Action & Research agendas from the Phnom Penh SOS meeting and objectives outlined in the PAPUSSA proposal

Aquatic Product	Producers	Market	Local officials	Planners (Senior Officials)
WP2				
O1	Research on wider impacts for health of wastewater reuse			Identify the causes of skin irritation Research causes of diarrhoea
Other	Research to reduce impacts of polluted wastewater on fish and vegetables Research on biological filters/wetlands constructed for wastewater treatment Reduction of small – research??	Develop techniques to preserve products and maintain quality in the market Look for other markets outside city – province – other country x2 *Research on fish diseases, also crazy disease & insect diseases of morning glory which reduce production	Research on treatment and recycling of wastewater Research on the ecology of the two main plant & fish culturing lakes in Phnom Penh	Research on the ecology of the two main plant & fish culturing lakes in Phnom Penh

Table 4.12. Comparison of Action & Research agendas from the Bangkok SOS meeting and objectives outlined in the PAPUSSA proposal

Aquatic Product	Producers	Market	Local officials	Planners (Senior Officials)
WP2				
O1		To study the strategies to cut the lifecycle of parasites	To study chemicals in aquatic production	
WP 3				
O1	To provide organic fertiliser to produce morning glory To develop ways of controlling golden cherry snails in canals	To develop ways to prevent disease in aquaculture		
O1	To study the content of wastewater from factories and village-estates			
O4		To study movement of community, industrial and residential		
O5		To study marketing trends of aquatic production	To understand taste and preferences of consumers and markets of aquatic production To study demand of the pesticide / toxic free vegetables	
WP8.4				To disseminate new production technology to farmers

5. Resource allocation for Phase 2

To facilitate planning for the coming year a simple approach was proposed concerning the allocation of resources to the various project activities envisaged, thus:

- one person works 200 days per year,

- 50% of their time is allocated to survey work = 100 days,

- 50% of time is spent in the field (remainder spent on training, data entry) = 50 days,

- if it is possible to do 4 questionnaires per day = 200 questionnaires per staff member,

- therefore, 3 staff x 200 = 600 questionnaires.

Permitting a sample of 200 households; each of which are questioned 3 times, once for the baseline survey plus first monitoring, once for the second monitoring and once for the third monitoring.

6. Overview of PhD studies

Individual presentations were given by the six postgraduate students on their proposed PhD areas/topics of study each of which were related to different aspects of the PAPUSSA project. The text of these presentations can be seen in full in Appendix 1 however their content is summarised briefly below.

Albert Salamanca, UOD presented an outline of his proposed PhD study which was entitled "Dynamics of peri-urban aquatic food production in SE Asia". The study although based in an urban context on fisheries and health will bring in wider geographical and developmental perspectives into creating a "bigger picture". As such it will be complimentary and add value to all of the work packages in years 2 and 3 of the PAPUSSA project. There will be particular focus on the dynamics behind "Trajectories of Change" for peri-urban aquatic food production i.e. in 10 years where are PUAFPS going? The structured approach would be based on:

- livelihood analysis - household,
- institutional analysis - institutions, policies, markets,
- commodity chain analysis - urban-rural interaction,
- GIS - classification of land uses.

Nguyen Thi Dieu Phuong, RIA 1, Hanoi presented the background to her proposed PhD study which included two prospective areas of research.

First, to improve productivity and sustainability of waste water aquatic farming systems in peri-urban Hanoi by looking at two particular peri-urban systems in Hanoi:

- fish culture in waste water fed urban lake (Thanh Tri),

- peri-urban integrated fish-livestock culture systems.

Second, to improve the productivity and sustainability of VAC farming systems in peri-urban Hanoi; to develop these systems she described studying the increasing conversion in peri-urban areas of rice fields into aquaculture systems and looking at improvements in nutrition, quality and availability of fish seed, and monoculture and polyculture systems.

Huynh Pham Viet Huy, UAF, Ho Chi Minh City presentation was entitled "Typical aquatic peri-urban systems - the current conditions and possible improvement interventions". His proposed studies would basically follow and complement the activities of WP3 and WP6 with the main focus of the first year being on monitoring production and livelihood related issues, this then being the foundation to lead on to possible interventions in year 2. These interventions would essentially be related to:

- production technology,
- water/resource use strategies,
- livelihood resettling strategies, also potential social consequences of those unable to relocate.

Ms Helle Marcussen, KVL, Copenhagen entitled her presentation "A study on the environmental chemistry and toxicology of heavy metals in aquatic production systems receiving urban waste water in SE Asia". Proposing study sites in HCMC, Hanoi and Phnom Penh she outlined the objectives of her studies as:

- screening of waste water, sediments, fish and aquatic plants for heavy metal residues.
- mass balances, speciation and biogeochemical cycling of metals at critical concentrations.
- risk assessment of consumption of products from peri-urban waste water systems.
- evaluation of future risks.

Mr Will Leschen, UOS outlined two proposed areas of research, the first being a study on comparing the prevalence and impact of zoo-onotic Food Borne Trematodes (FBT), particularly *Clonorchis sinensis* (liver fluke) in communities consuming fish originating from waste water and non waste water culture. Secondly he described a study in developing practical, cost effective methods for depuration of peri-urban aquatic products produced in waste water – both fish and aquatic plants – in order to minimise food safety and human health concerns and thus promote the longer term sustainability and profitability of waste water cultured aquatic products from the peri-urban environment.

Due to the absence from the meeting of **Mr Charlie Price** (UOS), Dr Nigel Wilby, (UOS) gave a presentation on his behalf on his proposed area of study - Assessment of risks associated with chemical contaminants in aquatic vegetable farming in PUAFS. This study would be complimentary and very much run in conjunction to two other current research projects in agrochemical use in tropical agriculture & aquaculture i.e. MAPET, MAMAS. Essentially the study would be based around identifying and quantifying the relative risks for aquatic vegetable producers and consumers in urban and rural locations, whilst similarly comparing the associated risks between aquatic and terrestrial vegetable production systems.

7. Prioritising production systems for further investigation

Participants were requested to begin to think about how to prioritise those production systems for further consideration during project activities in WP2-4. An outline matrix was developed during open discussion with all participants (Table 7.1) and it was noted that a group activity later in the day had been set aside with the objective of completing the matrix.

Table 7.1. Outline matrix for prioritising production systems for future investigation

City	Plants		Fish	
	wastewater	non-wastewater	wastewater	non-wastewater
Bangkok	+++	+		
Phnom Penh				
Hanoi				
Ho Chi Minh				

It was reiterated to participants that the next phase of work would consist of WPs2-4 that would focus on households and WP8, which has already commenced. It was also proposed that the next phase would consist of structured and non-structured elements; the agreed division of labour between these two activities is outlined in Section 5. Based on outcomes and experience gained from the situation analysis, participants, organised in groups with particular knowledge of each city region, were requested to identify the most important PAFPS; results of this activity are summarised in Table 7.2. Following completion of the matrix, discussion among participants turned to the possible need for controls, and whist it was noted that this would be important for certain aspects of the health and hygiene monitoring, it was also suggested that there may have to be a compromise in other areas where, for example, suitable control systems were absent. Having identified the most important production systems, city groups were then requested to further narrow the focus of future project activities by identifying and justifying which production systems would be studied in the second phase, and how many households would be interviewed.

The Bangkok group noted that as morning glory is popular and commonly consumed, this would constitute one production systems for further study and as the research group is based in the Faculty of Fisheries, the other system identified for further research would be hybrid catfish production; one hundred households engaged in each activity will be sampled in the next project phase. Considering Hanoi, the group identified three communes for further study, Tranh Phu, which is close to the city centre and where both fish and plants are grown using wastewater, Dong My, where fish are grown using wastewater, and Dac Tha, where fish are grown without using wastewater. It was proposed that 40 households in Tranh Phu would be interviewed, 70 in Dong My, 35 in Dac Th, and that the remaining 55 households would be non-producers acting as a control. For Ho Chi Minh, the four most important production systems (Table 7.2) were selected for further study, and it was proposed that 50 representative households engaged in each activity would be studied, although a proportion might have to be controls. For Phnom Penh it was agreed that the focus would be on morning glory production using wastewater (150 households) and non-wastewater fish production (50 households).

Table 7.2. Summary matrix prioritising production systems for future investigation

City	Plants			Fish		
	Wastewater		non-wastewater	wastewater		non-wastewater
Bangkok		(1) morning glory (2) mimosa canal			(3) hybrid catfish fed on slaughter house waste (4) polyculture fed on canteen waste and agricultural by-products	
Hanoi	(1) Tran Phu			(2) Tran Phu (3) Dong My		(control Dac Tha)
Ho Chi Minh	(2) mimosa-duckweed, Binh (3) morning glory, Thu Duc			(1) fish-lotus, Binh Chanh (5) rice-fish, Binh Chanh		(4) integrated livestock fish (District 9)
Phnom Penh	(1) morning glory, mimosa (2 sites, Boeung Cheung Ek)		(4) lotus/morning glory (Boeung Cheung Ek)	(2) pen/pond culture (Boeung Kok)		(3) pond/cage, Dech Pha (5) wild fish, Bung Saunvy

8. Planning integrated structured monitoring[3]

This session was devised and set up in order to discuss and brainstorm ideas for those particular areas/focus points which would be included in the base-line and monitoring sections of the questionnaire and monitoring which will be the integral part of next years Work Packages (2, 3 and 4). The participants were divided up into three groups to look at and discuss particular aspects of next years work packages in relation to this questionnaire.

8.1. Work Package 2: health indicators

This group discussed and then proposed Health Indicators that should be included in the Baseline and Monitoring Questionnaire. First, more general aspects of the questionnaire were discussed and it was suggested that it would be logical to structure the questionnaire so that it would follow the natural sequence of:

Household – Production – Harvest – Transport – Market – Consumption

There was also a discussion on the importance of the person(s) within the household who would actually be going to fill in the questionnaire in order that there was a standardisation and lack of bias throughout the years monitoring. It was suggested that due to availability throughout the year and also knowledge about the overall "goings on" within the household e.g. food consumption, health issues etc that if possible the mother would be the best person to interview.

The provision of an incentive, either monetary or non monetary, for individual households participating in the monitoring and completing the questionnaire three times during the year was also discussed. Anders (KVL) and staff from NIHE gave examples from their previous health related HH surveys where oral re-hydration and drugs were made available to treat individuals within the communities they were monitoring. Another way would be to build in frequent feedbacks to the households and communities about the information collected in the surveys giving individuals an incentive and thus a sense of ownership towards the project.

General household information: divide questions into first time interview with updates only and info which is likely to change.

Water source: wastewater volume measurement (through a channel or pipe(s)) or could be more simply be measured by observable water levels e.g. within a waste water lake using a particular, well known reference point e.g. a building, tree etc. This could also be done retrospectively to give us a good idea about historical trends. Identify and monitor point sources of pollution.

[3] Editorial comment (Anders Dalsgaard) - Would it be possible (and I think relevant!) to ask each project partner when we provide drafts questions for the structured questionnaire to JUSTIFY why a particular question is proposed included? Also, each partner should already now consider how the information obtained will be analysed (statistical software and methodologies). I know the BKK workshop will address the database issue. But this meeting could also be a place for discussion justification, relevance and subsequent data analyses, etc. This is one way of having all of use to focus and only include key and main questions.

Perceptions of quality: smell, colour, transparency of water etc. These are questions, when worded correctly, which can be asked relatively simply and can be used to triangulate/check our more conventional scientific water and environmental quality monitoring.

Products:

- plants/fish
- species cultured – culture system harvested –
- market purchase – human or animal food
- method of preparation
- which parts are used and sold - which discarded

Production Systems:

Labour
Origin/Ethnicity
Age
Sex
Type of Exposure to: wastewater & chemical products

Types and means of applying chemicals – types – how often?

Protective measures – list – gloves, boots, clothing – if not wearing why not?

Disease problems:

From the SOS workshops skin problems related to working within PUAFPS were highlighted as important particularly in Phnom Penh and Hanoi.

Detailed Health Monitoring work at specific sites?

NIHE already involved in detailed studies on impacts on health from waste water systems in Hanoi.

Information already available from Thanh Tri

It was discussed and finalised that the majority of the detailed work on health would be centred on Hanoi and Phnom Penh –

The monitoring of skin problems would involve a less detailed protocol for study – there would be less need to involve actual laboratory analysis – more a quantitative and comparative (visual) study which could be included within a routine household monitoring framework. It was also mentioned that farmers themselves quite often don't recognise or identify certain skin conditions relating from their work as a problem, more an occupational hazard – therefore there is the need to build into our monitoring some sort of means of identifying and quantifying the prevalence of individuals who are affected. This study could quite effectively be carried out in Phnom Penh although there was a need

identified for training of local staff (through NIHE) to carry out this work – if possible to incorporate dermatologists in Phnom Penh into the survey.

Blood samples: were considered not very valid for our studies

Faecal samples: Prevalence of **diarrhoea** can quite easily be measured within households

Phnom Penh: wastewater lake system

– collect figures/data/parameters on:-
  - BOD, total nitrogen and phosphorus
  - helminths
  - faecal coliforms

The sampling procedure should involve a small number of sampling points ranging from the waste water inlet through to the main outflow to the lake thus getting a picture of change/gradient in water quality and associated health parameters throughout the lake. Through KVL it was discussed that there could be the possibility of funding an RUA student to help in this study.

As regards to bacterial sampling of the market product (Morning Glory) there was some uncertainty and question to its actual validity due to the large potential from other sources from within and outside the market for contamination. However it should be feasible to collect dried samples for accurate analysis of heavy metals. The possibility of sampling bivalves /fish for bio-accumulation of heavy metals was also discussed.

Hanoi Systems – Thanh Tri

RIA1 and NIHE would be available to collaborate on work in Thanh Tri District. The monitoring of diarrhoea should be prioritised with faecal sampling possible. Helminths and the protozoan parasites *Cyclospora spp.* can also be monitored, with NIHE having previous experience and expertise in this area. There should also be a focus on monitoring products going to market e.g. evidence that some parasites can be found attached to the roots of aquatic plants. Food Borne Trematode (FBT) parasites such as *C. sinensis* the liver fluke have low prevalence in fish (2%) – however there is very much the need to compare its prevalence in waste water cultured and wild fish, the latter of which could act as natural reservoirs for re-infection. A RIA1 BSc / Masters student could be involved in a study monitoring the prevalence of FBT's, tracing waste water cultured fish going outside Hanoi - a study on their final location in Provinces and their impact on provincial consumers. This would very much compliment one of the previously mentioned proposed PhD areas of study.

8.2. Work Package 3: production systems and livelihoods

Structured household survey

Land and water use strategy
- Demarcate production system (Boundary)
- Assess household and community access

Bio-resource flow
- Effluent quantity
- Key nutrient fluxes/flow and exchange rate and nutrient level measured in WP2 (Ensure sampling not replicated)
- I/O of farming system
- Product and harvest rate/stock and un-stocked (seasonality, shock, consumer demand,)

Livelihoods aspects
- Activities
- Expenditures
- Health
- Consumption
- Benefit/income/sell from aquatic product

Unstructured study

- Wider benefit/Marketing share/extent of supply and distribution network
- Input supply and marketing produce
- Role of network in communicating knowledge
- 30 households per site every 2 weeks to facilitate participatory M&E

8.3. Work Package 4: monitoring group

This group looked at aspects connected to WP4 i.e. Social Policy and Monitoring although during the course of the discussions aspects of production and environmental parameters within PUAFPS were also brought up, hence there was some overlap between the different work packages. The following areas were suggested as being important for including questions in the questionnaire:

- water quality/quantity (factories)
- production - fish , vegetables (output)
- chemical use
- labour use:
  - (hire, share…..)
  - (population)
  - (migration)
- seasonal Demand – consumption/quality/ price and taste.
- marketing channels – seasonal variations- who, where, how.
- modifications (change to production systems)
- falls in/threats to production

Un-structured monitoring over and above set questionnaire

Having completed the above the following were suggested as areas to monitor over and above the standardised monitoring survey and questionnaire. To some extent these will be related to the previously mentioned postgraduate studies which will be carried out in conjunction with the project.

a. Longer term development contexts (e.g. urbanisation, industrialisation) and HH livelihood contexts – strategies:

- vulnerabilities
- assets

Here we thought it important to be able to contextualise the details of the surveys (which are being undertaken over just a single year) in terms of wider trajectories of change in the study areas. In other words we need to know patterns of urban and industrial evolution over a 10, 20 or 30 year period, including, for example, how the land market has changed and so on. To give you an example: around Boeung Cheng Ek (wastewater lake in Phnom Penh) there has been the development of factories over the last 5 years. This has the potential to profoundly change the nature of the resource and also the pattern of livelihoods in the area. We need to understand this is we are to embed our own data/results in the wider context, historical, economic, geographical and more.

b. Policies and institutions

For this add-on we thought that it might be necessary to understand in more detail the institutional and policy context within which change is occurring. This might mean interviews with key people in different agencies, or with local leaders/key informants. Which institutions make a difference? Which policies impact on production systems? And so on. This would build on the initial base-line Institutional analysis carried out in WP1.

c. Commodity chains – social characteristics

We may need to dig out more detail about the ways in which commodity chains operate – not just their mechanics, but how they are (or are not) embedded socially. An example of this very simply would be to physically follow – (on a motorbike?) – an individual fish or bunch of water spinach from the place of production and harvest to the point of consumption. Whose hands does it pass through? How is it managed? How is it packaged/treated?? Who it is sold to? Even, how is it cooked and who consumes it. Whilst being good fun this methodology or type of investigation would be an extremely effective means of triangulating or checking the information we have already received from more structured interviews or the PCA's, and could uncover areas and people involved whom we were previously unaware of.

d. Targeted investigations (qualitative) of tensions/conflicts – effects, coping strategies, reconciliation.

Here, we may find it worthwhile to highlight those households in the sample where particularly interesting/important/contentious issues arise and return to them for a more qualitative interview type of investigation. This would enable us to get some 'thick description' to add to the survey data we are collecting and, perhaps, explain in more detail why certain things happen (or don't), whilst also being careful and sensitive not to exacerbate or worsen the situation.

e. Additional social characteristics not evident from base-line – problematising?? the HH ethnic focus.

It may be that we need to think more carefully about how the household operates. We are assuming in the survey that the HH is an individual by another name – that it is undifferentiated. That it is a single unit of analysis. However within the household there could be a lot of interesting things going on. Men doing one thing, women another, young and old different things again. Furthermore there may be points of tension and contention that we are ignoring or glossing over. In particular inter-generational conflicts that often arise when economies and social norms and mores change. So we may need to delve into this a little more deeply than our questionnaire survey allows.

f. Identified modification – detailed investigation.

This last one links with 4, above. If households have made significant, surprising, or interesting modifications to their production systems then we may find it worthwhile to return and look at this in more detail. I have a hunch that while we have categorised production systems rather neatly what we may find it, in fact, a range of small modifications to systems within each category, reflecting the needs, resources, expertise and so on of individual families.

9. Forward workplan

Table 9. Proposed Work Plan for January - November 2004

January - February		**March – April**	**May**		**November**
Preliminaries Questionnaire developed Training needs Testing + pilot study		**Baseline Survey** + database set up 2 months staff almost full time	**Monitoring 1** For 1 month		**Monitoring 2** For 1 month

A more detailed plan is shown below:

January 2004

- 1st week in January - Release of P and P meeting (Hanoi) report - from Stirling (Stuart and Will)

- Four city partners making initial contacts with communities they have chosen to monitor - arranging community meetings to explain aims and objectives of monitoring households - also incentives of next years work - KU, UAF, RUA, RIA1, NIHE.

- By 15th January - specific questions or areas which 4 city partners wish to include in the Baseline and monitoring questionnaire - whole draft questionnaires welcomed - KU, UAF, RUA, RIA1, and NIHE to send to UOS.

- Development of questionnaire - responsible - UOS, UOD, AIT, KVL.

- Begin to develop database - responsible UOS.

- Identification and implementation of training needs for staff for next year - i.e. Training in Access for databases, training in household monitoring- how to collect answers from questionnaire - responsibility of PI's in each city - KU, UAF, RUA, RIA1, NIHE

- By 1st week in February draft form of baseline and monitoring questionnaire available - responsibility UOS, UOD, AIT, KVL.

- Deadline 31st January 2004 - Submission of annual reports, each partner is responsible for reporting on activities undertaken over the year - KU, UAF, RUA, RIA 1, AIT, UOD, UOS, KVL, NIHE.

February

- Correct/accurate translation of questionnaire into local language – KU, RUA, UAF, RIA 1, NIHE.

- Mid-February - Pilot testing questionnaire – looking for problems, double meanings etc with questions - KU, UAF, RUA, RIA 1, NIHE
- Refinement of questions in questionnaire – Stirling, Durham, AIT, KVL
- Further development of database - Stirling et al.
- Training of staff completed by the end of February
- Final working draft of questionnaire by the end of February
- By end of February: Target communities having good awareness of years monitoring programme ahead; individual households chosen for monitoring following consultation with key community persons/informants.

March - April

- Beginning of March – start Baseline survey questionnaire in chosen households/communities – KU, UAF, RUA, RIA 1, NIHE
- Evaluation of questionnaire – any small refinements to questions.
- 3 staff to be working full time on questionnaire survey throughout March and April -
- Each city partner to begin entering questionnaire data into database

May - June

- Second phase of household monitoring - questionnaire to chosen households again.

November

- Third phase of household monitoring

Items remaining to be finalised

Check interval between household monitoring – should be approximately equal?

Also decision needed over whether to have initial separate baseline questionnaire in March followed by 2 monitoring questionnaires (May and November) – or alternatively just have 3 straight monitoring questionnaires for the year – (March, May and November) which will each include baseline data.

Appendix 1. Workshop agenda

P&P meeting agenda

Sunday 14th December

09:00-09:10 Introductions
09:10-09:30 Review of meeting objectives
09:30-10:15 Outcomes of SOS workshop Ho Chi Minh City

10:15-10:30 coffee

10:30-11:15 Outcomes of SOS workshop Phnom Penh
11:15-12:00 Outcomes of SOS workshop Bangkok

12:00-13:00 lunch

13:00-13:45 Outcomes of SOS workshop Hanoi

13:45-15:00 Workshop sessions in groups on

- risk assessment
- poverty targeting
- research and action agendas

15:00-15:30 tea

15:30-16:30 Report back and discuss forward workplan

Monday 15th December

08:00-10:00 Overview of PhD studies

Albert
Phuong
Huy
Helle
Will
Charlie

10:00-10:15 coffee

10:15-11:30 Planning integrated structured monitoring

11:30 -13:30 Reporting back on integrated monitoring and consideration of data management

13:30-14:30 lunch

14:30-16:00 Data management and communication

16:00-16:30 tea

16:30-17:00 Cost Statement and draft Annual Report review - PIs
Evaluation of project activities - RAs

17:00-17:30 Round-up session

Appendix 2. Workshop participants

Participants	Institution
Professor Phung Dac Cam	NIHE
Dr Phan Thu Phuong	NIHE, Hanoi
Dr Pham Auc Phuc	NIHE
Do Thuy Trang	NIHE
Nguyen Dang Tuan	NIHE
Nguyen Huy Teram	NIHE
Dr Pham Anh Tuan	RIA1, Hanoi
Nguyen Dieu Phuong	RIA1
Kim Van Van	RIA1
Mr Pham Bau	RIA1
Mr Chan	RIA1
Nguyen Tat Hao	RIA1
Nguyen Huu Hoa	RIA1
Pham Van Trang	RIA1
Nguyen Chien Van	RIA1
Dr Le Thanh Hung	UAF, HCMC
Pham Viet Huy	UAF
Bui Thi Phuong Thao	UAF
Nguyen Truc	UAF
Tran Van Minh	UAF
Chouk Borin	RUA, Phnom Penh
Thak Kuntheang	RUA
Chim Rumuny	RUA
Sok Daream	RUA
Dr Ruangvit Yoonpundh	KU, Bangkok
Dr Varundhat Dulyapurk	KU
Chumpol Srithong	KU
Nguyen Song Ha	STREAM, Sapa, Ministry of Fisheries
Anders Dalsgaard	KVL Copenhagen
Helle Marcussen	KVL Copenhagen
Dr Jonathan Rigg	University of Durham
Albert Salamanca	University of Durham
Dr Siriluck Sirisup	AIT, Bangkok
Wanwisa Saelee	AIT
Prof Peter Edwards	AIT
Dr David Little	UOS, Stirling
Dr Stuart Bunting	UOS
Dr Nigel Willby	UOS
Will Leschen	UOS