

Huge potential for safe fish and vegetable production in urban areas

RIU

Validated RNRRS Output.

Agriculture and aquaculture in and around cities creates jobs, and can improve the environment, reduce waste and provide good cheap food. Previously, the risk of contamination from poor quality and waste water posed dangers. But safe ways of producing fish and growing water vegetables around cities are now available. Techniques for aquaculture and horticulture have been tested near Hanoi and Ho Chi Minh City in Vietnam, Blantyre in Malawi, Phnom Penh in Cambodia, Bangkok in Thailand, Yaoundé in Cameroon, Dhaka and Mymensingh in Bangladesh and Port Moresby in Papua New Guinea. The potential for raising fish and growing vegetables to supply booming urban markets in developing countries is enormous and could have a major impact on improving incomes, food and nutrition.

Project Ref: **AFGP03:**

Topic: **3. Improving Fishers Livelihoods: Better Fishing Management & Aquaculture**

Lead Organisation: **University of Stirling, UK**

Source: **Aquaculture & Fish Genetics Research Programme**

Document Contents:

[Description](#), [Validation](#), [Current Situation](#), [Current Promotion](#), [Impacts on Poverty](#), [Environmental Impact](#),

Description

Research into Use

NR International
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Geographical regions included:

[Bangladesh](#), [Cambodia](#),
[India](#), [Malawi](#), [Nigeria](#),
[Papua New Guinea](#),
[Tanzania](#), [Thailand](#),
[Uganda](#), [Vietnam](#),

Target Audiences for this content:

[Fishers](#), [Consumers](#),

AFGP03**A. Description of the research output(s)***1. Working title of output or cluster of outputs.*

In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

Local aquatic food for cities

Production of safe and nutritious fish and aquatic vegetables at the peri-urban interface of growing cities: an opportunity for poverty alleviation, food supply and environmentally sustainable greener cities.

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

Aquaculture and Fish Genetics Research Programme
Natural Resources Systems Programme

Programme development funding to Papussa (EC funded INCO DEV Production in aquatic Peri-urban Systems in SE Asia (Papussa) project : International Scientific Cooperation Projects Contract number: ICA4-CT2002-10020) by DFID-AFGRP for extra project dissemination activities including Peri-urban Aquaculture Development Workshop in Dhaka, Bangladesh, November 2005, and Special Peri-urban Aquaculture Edition of Urban Agriculture Magazine.

3. Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

AFGRP - R8287, D03, D10, T07, A11, A19 and NRSP - R7872, R8365, R8090

South Africa: University of Natal (R8287, T07)

Nigeria: IOMR/Ministry of Fisheries (R8287, T07)

Vietnam: University of Agriculture and Forestry (UAF) (D03)

Cambodia: Royal University of Agriculture (D03)

Bangladesh: BFRF, BRAC, Caritas (D03)

China: Ministry of Fisheries (D03)

India: Ministry of Environment (R7872, R8365)

Thailand: Kasetsart University (D03)

Regional: WorldFish Center (A19)

UK: University of Stirling (R8287, D03, D10, T07, A11, A19), University of Durham (D03), University of Essex (A11)

4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? (max. 400 words).

This requires a clear and concise description of the output(s) and the problem the output(s) aimed to address. Please incorporate and highlight (in bold) key words that would/could be used to select your output when held in a database.

Although attention has been drawn to the potential benefits of **peri-urban aquatic food production** (PAFP), in developing countries the value of such systems had been largely unrecognised, with impacts of contamination, changing access and **urbanisation** unknown. Single disciplinary studies, though technically informative, had failed to address the interacting context determining the evolution of PAFP around rapidly growing cities, and their benefits to poorer people, through involvement in production, as intermediaries and as consumers. Major constraints to informed policy and management in rapidly increasing peri-urban zones result from the lack of information on stakeholders and the values they ascribe to aquatic production systems, and the lack of balanced multi-disciplinary assessments of **public health risks, waste water treatment capacity, impacts on food availability** and **livelihoods**. AFGRP and associated research sought to address these issues and the associated problems of access to and limited availability of technical advice.

Work was carried out between 1998 and 2006. Key findings were that;

- Aquatic food production in peri-urban waters is an important economic activity providing income, employment and good quality food;
- It has particular connections with poorer and more vulnerable groups, whose links and benefits can be engaged; particular skills and resourcefulness can be used to support community resilience in changing conditions.
- Water quality and environmental risks can be better managed, and networks of water managers and producer associations can respond flexibly to evolving demands as cities grow and service demands change.

A range of outputs included international reference information on key cities with targeted copies in local languages, policy briefs and broadcasts to highlight production opportunities and inform managers, and user guides to inform producers of risks and new opportunities, in both production and markets. Novel production techniques for both plants and fish have also been trialled. The output offers an effective and practical approach to harness these components effectively in urban development, meeting important needs for food, health, income and environments.

5. What is the type of output(s) being described here?

Please tick one or more of the following options.

Product	Technology	Service	Process or Methodology	Policy	Other Please specify
X	X	X	X	X	

This output covers a suite of approaches that can be adapted according to the needs of each city.

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

Aquatic animals and aquatic plants
Environmental services

Other commodities that these outputs could be applied to include urban agriculture products, and other non-food peri-urban products such as ornamental fish, cut flowers, recreational angling.

7. What production system(s) does/could the output(s) focus upon?

Please tick one or more of the following options. Leave blank if not applicable

Semi-Arid	High potential	Hillsides	Forest-Agriculture	Peri-urban	Land water	Tropical moist forest	Cross-cutting
X	X	X		X	X		X

This output would be appropriate in a range of production systems in urban and peri-urban environments depending upon potential for aquatic production.

8. What farming system(s) does the output(s) focus upon?

Please tick one or more of the following options (see Annex B for definitions).

Leave blank if not applicable

Smallholder rainfed humid	Irrigated	Wetland rice based	Smallholder rainfed highland	Smallholder rainfed dry/cold	Dualistic	Coastal artisanal fishing
X	X	X	X	X	X	X

This output has potential in all farming systems associated with urban and peri-urban areas.

9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

From Crop Post Harvest Programme - Food safety in peri-urban horticultural products.

From Natural Resources Systems Programme - Peri-urban: Participatory action planning and implementation; Self-help groups and community action; Planning and development policy and method in the PUI.

Particular value in implementation and uptake could be achieved by targeting outputs at smaller, up and coming urban centres where more flexible infrastructures, particularly in terms of waste water management, would be more conducive to incorporating and encouraging effective and safe peri-urban aquatic cultures into their future urban development strategies.

The vast scale and network of poor persons involved in and reliant on urban and peri-urban waste water fed culture in terms of production, marketing and consumption often goes un-noticed and unprotected. With co-ordinated approaches to informative management institutional constraints can be overcome in order to maintain

and develop peri-urban aquatic food production systems within the spheres of sustainable urban development policy and planning.

Validation

B. Validation of the research output(s)

10. **How** were the output(s) validated and **who** validated them?

Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the “who” component detail which group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation (max. 500 words).

Validation and triangulation of research findings and subsequent outputs has been achieved through a continual process of stakeholder dissemination and dialogue. Through partner organisations in each country research findings were fed back to each of the target communities by presenting them in both open and closed sessions to a range of stakeholders from different income, cultural, gender and ethnic backgrounds. Overall findings were validated in State of the System (SOS) meetings with four categories of stakeholders: Producers; Market actors (including supermarket); local level government officials; and Government Policy, Planning and Research level actors. Diverse written outputs from these participatory sessions were distributed in dual language format for further discussion. Within this process an equal gender balance was always aimed at but not always possible.

Novel production approaches were trialled with poorer producers based upon a mix of researcher and producer perception. These trials not only concentrated on increased production, but also on improved techniques to protect producer health. Neighbouring producers have adopted some of the production techniques and are reporting improved market opportunities. Partner organisations are now incorporating findings from this research into their other fields of work.

11. **Where and when** have the output(s) been validated?

Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above (max 300 words).

Outputs were validated at various locations across Africa and Asia: Lagos - Nigeria, Blantyre - Malawi, Dar Es Salaam - Tanzania, Kampala - Uganda, Yaoundé - Cameroon, Dhaka - Bangladesh, Kolkata - India, Hanoi and Ho Chi Minh City - Vietnam, Phnom Penh - Cambodia, Bangkok – Thailand. Although there was variation in the extent of urbanisation, all locations were peri-urban, many relying upon formal and informal irrigation by way of wastewater from cities. Whilst not exclusively rice-based the wetlands supported a wide variety of aquatic plants, most notably in Asia. All sites could be considered high potential and the sector generally has potential for many

tropical and sub-tropical cities that tend to have a large poor population on the periphery.

Current Situation

C. *Current situation*

12. **How and by whom** are the outputs currently being used? Please give a brief description (**max. 250 words**).

Producer manuals are now being used in the research areas by extension officers, farmers and commune officials to develop tilapia fingerling production and improve aquatic plant production for the benefit of poorer producers.

In some locations the WorldFish Centre is exploring mechanisms to further develop urban and peri-urban aquaculture based upon the knowledge gained through the DFID-funded research.

Associate organisations are using the examples from existing work to develop proposals for new development projects. The network that has developed between all various project partners has also led to involvement in a World Bank funded project.

Materials produced from peri-urban projects are currently being used by educationalist on a small scale for training and business purposes.

13. **Where** are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used (**max. 250 words**).

The outputs are being used variously around Hanoi and Ho Chi Minh City in Vietnam, Blantyre in Malawi, Phnom Penh in Cambodia, Bangkok in Thailand, Yaoundé in Cameroon, Dhaka and Mymensingh in Bangladesh and Port Moresby in Papua New Guinea.

14. **What is the scale of current use?** Indicating how quickly use was established and whether usage is still spreading (**max 250 words**).

The scale of current use varies from a localised household level use of technically based outputs through peri-urban community level e.g. extension services, commune offices to a more metropolitan and international research and policy level. Many outputs were only completed within the last two years and whilst uptake has been good this is still localised. Evidence at international level shows some of the findings are starting to be included in discussions for FAO and World Bank projects. There is clearly scope for these outputs to be taken up wherever there are cities.

15. **In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success?** (**max 350 words**).

At local community level informal institutions have had considerable beneficial effects in helping to develop interest in project research and outputs in terms of filling the institutional responsibility void found at higher levels for aquatic food production systems. Examples of these include Farmer's, Women's and Agricultural Unions.

Those involved in the research and promotion of the output have had to work with greater interdisciplinarity because of the need to consider social as well as technical issues. This approach has strengthened the relevance of outputs and built the capacity of several partners to deliver other projects more effectively.

In order to bring together partners from the various projects across Asia, a regional Platform on Urban and Peri-Urban Aquaculture was established and is managed by one UK and one Bangladeshi partner. Although still in its early stages this has facilitated information sharing and lead to the involvement of some partners in new projects. This mechanism could be adapted for effective development in other areas.

Current Promotion

D. Current promotion/uptake pathways

16. Where is promotion currently taking place? Please indicate for each country specified detail what promotion is taking place, by whom and indicate the scale of current promotion (max 200 words).

In Asia key partners in Ho Chi Minh City, Hanoi, Phnom Penh, Bangkok, Dhaka and West Bengal are disseminating local language versions of five policy briefs and DVDs to over 1000 decision making stakeholders. In Vietnam direct association with local farmer groups is also demonstrating uptake of improved aquatic plant and fish production technologies with more than 500 households. In Cambodia an independent NGO is also distributing the DVD amongst its user community. In Thailand an independent think-tank involved in assessing the policy briefs is currently using them to respond to requests from around 20 municipalities keen to learn more about peri-urban aquatic plant production.

In Africa key partners are working with a range of stakeholders to continue the development of technical solutions whilst at the same time working with policy makers to ensure a positive policy environment exists to encourage peri-urban aquaculture development.

17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. (max 200 words).

Cities have developed on an ad hoc basis and as such major infrastructure that could facilitate urban and peri-urban aquatic production has not been installed. Peri-urban policy usually favours industrialisation at the expense of agriculture, however agriculture and aquaculture in and around cities could create employment, mitigate environmental degradation, reduce waste processing costs and provide affordable quality food.

In some locations the market considers food produced in wastewater-fed ponds to be of inferior quality.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be used to identify perceived capacity related issues (max 200 words).

Early consideration of appropriate drainage and formal planning procedures that leave space for aquaculture development as part of wastewater treatment.

Education to inform people of the safety of wastewater-raised food, as part of general food hygiene education. Research contributing to this output confirms generally high sanitation standards, fully comparable with other local products, but the procedures for effectively monitoring food safety are often lacking.

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? (max 300 words).

Involving the largest number of poor people and their representative organisations in the early stages of the project is key to secure ownership of the outputs of the project. As a result of early dialogue with the key informal institutions at a community level to better understand the constraints and benefits for peri-urban aquatic production for both poorer and better off households it proved easier to channel outputs and research findings through such institutions to poorer people and subsequently monitor their response.

Taking time and care in translation and format of outputs aids uptake. Outputs work best when written or translated by experienced journalists rather than translated by government or scientific partners who tend to use formal language that stakeholders find unappealing and difficult to understand.

Impacts on Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

Household baseline surveys were conducted in four indicative peri-urban communities around each of the cities studied in Africa and Asia. Subsequently one year's detailed household monitoring was conducted covering income, well-being and the role of peri-urban aquatic production in poverty alleviation. Following these assessments, discussions between farmers and researchers lead to a participatory technology development period to improve production aspects relevant to each location. The results of these surveys and development trials have been recorded and assessed by all stakeholders involved.

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the

application and/or adoption of the output(s) (max. 500 words):

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed?*

These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;

- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*

Indicate the number of people who have realised a positive impact on their livelihood;

Although varying in timescale due to the different development statuses of each city, the majority of current producers changed from their original cultivation of rice on low lying seasonally flooded land to the production of either aquatic plants or fish as the city expanded. The impacts of this change resulted in household incomes increasing on average five fold from the same areas of land. Although overall incomes from aquatic plant cultivation were lower than fish farming, aquatic plant growers benefited greatly from more regular monthly and sometimes weekly availability of income due to the rapid regrowth of plant stocks. In terms of employment there were significantly higher percentage of women involved in aquatic plant cultivation compared to fish farming, with women also playing the major role in marketing both aquatic plants and fish.

From our project interventions 3 peri-urban rice producers in Hanoi for the first time successfully produced tilapia fingerlings in their modified rice plots, one aquatic plant farmer in Bangkok produced chemical-free morning glory in an integrated fish-plant system, and 40 households practicing fish farming in 2 peri-urban communities in Ho Chi Minh City adopted information from calendars distributed as part of the project to improve their fish pond culture.

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? (max 300 words)

Where urban and peri-urban aquaculture relies upon wastewater these technologies could be considered as remediation measures. This would be promoting lower cost, lower maintenance wastewater processing and recycling wastewater for agricultural use and in the process “recapturing” valuable nutrients which otherwise would be lost.

Environmental success and benefits of peri-urban systems strongly depend on the urban authority’s capacity to effectively control waterborne pollution through effective monitoring and regulation. In effect peri-urban aquatic food production systems can act as barometers or indicators of a city’s capacity to maintain a cleaner, healthier environment for its citizens. One potential measure may be to incentivise aquatic production by indirect “green” subsidies such as tax concessions.

Indirect benefits include creation and maintenance of green spaces that can be used for recreation and tourism whilst increasing the biodiversity of peri-urban areas.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? (max 100 words)

In some limited circumstances aquatic production in and around cities may also use pesticides and introduce nutrients, but AFGRP outputs show that these can be reduced where alternatives are available and people are educated about the benefits of change.

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? (max 200 words)

Peri-urban aquatic systems are often located in wetlands on the peripheries of cities. Urbanisation, with its ever increasing pressures on all land and water, has for many cities involved the gradual encroachment and finally disappearance of such wetlands. This disappearance has already had severe consequences, particularly for poorer people, in two ways. Firstly for those cities which are now facing increased seasonal occurrence and severity of flooding with associated loss of life, displacement and crippling financial burdens, the deliberate and steady removal of these wetlands has exacerbated the position as they had previously fulfilled the vital roles of buffers or “sinks” for soaking up, containing and then safely releasing the increasing flood waters. Once they have been drained, filled and built upon as a consequence city authorities have had to spend increasing proportions of their budgets in flood prevention strategies.

Conversely for cities where climate change has increasingly resulted in declining rainfall, the deliberate removal of existing wetlands for urban construction has accelerated the overuse of water by lowering water tables followed by excessive ground water pumping. For these cities removal of wetlands will most definitely accelerate drought whilst also most adversely affecting the poorest people.
