Combating fish diseases improves farmers' returns

RIU

Validated RNRRS Output.

Practical and cost-effective methods are now available to help farmers detect fish-borne diseases quickly and accurately. Severe disease epidemics threaten aquaculture, particularly smallholder production. The new methods—and simple management improvements—lower the costs of treating disease and give farmers higher yields of better quality fish. These easy-to-use practices for safe and healthy production of catfish and shrimp are already widely used in Vietnam, Thailand and India. Six Asian governments are also taking up these methods to improve fish health management services. Because people are becoming more aware of the need for better fish disease control in aquaculture these techniques could have a major impact.

Project Ref: **AFGP05:**
Topic: **3. Improving Fishers Livelihoods: Better Fishing Management & Aquaculture**
Lead Organisation: **University of Stirling, UK**
Source: **Aquaculture & Fish Genetics Research Programme**

Document Contents:

Description

AFGP05

Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Cambodia, India, Iran, Lao PDR, Thailand, Vietnam,

Target Audiences for this content:

Fishers,

A. Description of the research output(s)

1. Working title of output or cluster of outputs.

New strategies for aquatic animal health management to increase aquaculture productivity, reduce environmental impact, improve livelihoods of smallholder producers, and widen benefits of sectoral growth.

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

Aquatic animal health for production, environment and livelihoods

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

DFID - Aquaculture and Fish Genetics Research Programme (AFGRP)

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.

R7051; R7054; R7463; R8093; R8119; D09

Institutional partners:

Aquatic Animal Health Research Institute (AAHRI), Department of Fisheries, Kasetsart , Bangkok, Thailand
Dr. Supranee Chinabut: supraneecb@yahoo.com
Dr. Temdoung Somsiri: tsi_f@yahoo.com
R6426; R7054; R7463; R8093; R8119; D09

Research Centre for Aquaculture Number 2, Ho Chi Minh City, Vietnam
Dr. Nguyen Van Hao: haoria2@hcm.vnn.vn
R7051; D09

Aquaculture and Fisheries Science Institute (AFSI), College of Agriculture, CanTho University, CanTho, Vietnam.
Ms. T.T Dung: ttdung@ctu.edu.vn
Dr N.V Tuan: tuants@ctu.edu.vn
R7054; R7463; R8093; D09

Department of Aquaculture, College of Fisheries, UAS, Mangalore, India
Dr C.V. Mohan: mohan@enaca.org
R7051

Network of Aquaculture in Asia-Pacific (NACA), Kasetsart University Campus, Bangkok, Thailand
Dr C.V. Mohan: mohan@enaca.org
Dr Flavio Corsin: flavio.corsin@gmail.com
Mr Simon Wilkinson: simon.wilkinson@enaca.org
D09

Institute of Aquaculture (IoA), University of Stirling, UK
Dr M. Crumlish: mc3@stir.ac.uk
Prof J Turnbull: jft1@srie.ac.uk
R7051; R7054; R7463; R8093; R8119; D09

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.*

Aquaculture is a valuable contributor to nutritional and income demands of rural and peri-urban populations within developing countries. The occurrence of disease outbreaks often of pandemic proportions, has however threatened the sustainability of the sector at all levels, and significantly added to the vulnerability of smallholder producers. Practical and cost-effective methods, and capacity to apply them, are critical needs. Responding to the increased need for aquatic animal health management in the Asia-Pacific region, over the past 10 years the AFGRP programme was instrumental in developing tools for managing aquatic animal diseases, including the viral disease, White Spot Disease (WSD) in tiger shrimp and bacterial disease, Bacillary Necrosis of Pangasius (BNP) in Vietnamese catfish. It has also helped to pioneer participatory approaches to aquatic health management, enabling producers to make better husbandry and disease management decisions where traditional diagnostic services are not feasible to deliver.

AFGRP research has produced and applied novel epidemiological tools, adopting methods used for control of human and livestock diseases, and a range of diagnostic methods for identification of pathogens and diseases affecting key aquaculture commodities. Effective field sampling techniques for monitoring aquatic health were produced and adopted. During this process the AFGRP and its partners enhanced capacity amongst farmers, extensionists and technical specialists, and the programme promoted more accessible action by smallholder producers by identifying key risk factors and farm level management practices.

The programme also created a novel internet-based repository of aquatic animal diagnostic expertise (E-Journal) to provide continuous inputs to capacity building and assisting in surveillance and disease management. This facilitated the development of better management practices (BMP) addressing local needs of farming communities. These have the potential to become increasingly widespread throughout the region and elsewhere and to make significant contribution to sustainability and livelihood outcomes of the aquaculture sector. Finally, the intervention systems developed by the programme have increasingly informed policy approaches in resource management and biosecurity.

This output therefore offers a well tested suite of management tools, capacity building and policy support capable of significant improvement to production risk control, environmental quality, and income, food and livelihood

security.

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 offers a suite approaches to effectively manage aquatic animal health strategies that impact on aquatic production systems relevant to the poor.

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

Main commodity (ies) upon which the output(s) focussed:
Aquatic animals

Output could be applied to:
Terrestrial animals and plants

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

The output is applicable in a wide range of production systems where aquatic production may require aquatic animal health management strategies.

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

The outputs have the potential to be of benefit in all aquatic production systems, especially where conventional approaches have not or cannot currently be applied.

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 Post Harvest Fisheries Research Programme - The development of a polymerase chain reaction (PCR) based method for the rapid and highly sensitive detection of aquatic vibrios.

By using a holistic approach, epidemiological tools and capacity which addresses local (e.g. country-specific) needs, can effectively contribute to addressing sustainability issues associated with the production of other livestock and agriculture commodities. Links between aquatic epidemiology and the control of human health problems such as fish-borne zoonotic parasitic diseases and Avian Influenza are also increasingly been established. The use of this strategy would be especially important in integrated farming systems, which are characterised by a close interaction between people, crops and aquatic and terrestrial animals.

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)**.*

Primary validation of diagnostic and epidemiological techniques was carried out in regional and UK partner laboratories and field locations using standard techniques, reported in peer-review journals. Uptake of aquatic epidemiology methods adopted by partner institutes was validated through project and institutional reviews. These continue to be adopted by all partners involved in producing outputs. Institutions in Vietnam have adopted epidemiological tools within health management studies in at least 4 additional projects, covering different aquaculture commodities and production systems.

Capacity built on epidemiology was recognized globally, with key members of the International Society for Aquatic Animal Epidemiology involved with production of this output and/or being trained through it. There is strong demand for further capacity on aquatic epidemiology, including requests by governments of at least six Asian countries, however the mechanisms to respond to this demand have not been finalised.

The diagnostic laboratory for detection of shrimp viral diseases established in RIA2, Vietnam, served for training and subsequent establishment of tens of similar laboratories nationally, showing the validity of the output, although this has no so far been replicated elsewhere.

Information uptake and effective control of diseases of Vietnamese catfish was validated using a controlled field trial. Management practices were adopted by various stakeholders including researchers, extension officers and farming households around the research areas. Discussions at farmer meetings and workshops confirmed that farmers following advised practices, especially concerning removal and hygienic disposal of dead fish, had a significantly lower incidence of disease outbreaks caused by BNP. Following the practices also lead to lower expenditures for ineffective treatments and higher yields of good quality fish products.

A questionnaire-based survey delivered to shrimp farmers highlighted that management practices developed through AFGRP for the control of white spot disease were adopted farmers in target regions. Anecdotal evidence also shows that farming communities involved with the project successfully changed their farming practices in response to the findings from these projects.

A questionnaire aimed at assessing the need for an internet-based repository of aquatic animal diagnostic expertise was delivered to 19 aquatic animal health specialists in Asia. The need was recognised by all interviewees. The website was produced and hosted by an Asian Inter-governmental organization (NACA).

*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 in specific locations in Vietnam, India, Thailand, Laos, Cambodia and I.R. Iran. Surveys aimed at assessing the validity of epidemiological methods were delivered in selected regions of Vietnam, India and Thailand. Epidemiological tools and capacity have been adopted in a Government institute in Vietnam (RIA2) and in one of the largest Vietnamese Universities working in aquatic animal health management (CTU) and in Thailand through the Department of Fisheries (DOF) Institute AAHRI. In I.R. Iran epidemiological tools were adopted to control the impact of a WSD outbreak.

The need for epidemiological tools was recognized by the government of all these 6 countries and, to different extents, further capacity on epidemiology has been sought in all the countries. Validation of methods to assess the health status of aquatic organisms was conducted by partner organizations in Thailand and Vietnam. Disease management practices were validated in both Vietnam (2002-2004) and Thailand (2000-2005) by farmers of different socio-economical status and producing aquaculture commodities within land-water production systems and using wetland rice based farming systems ranging from extensive to intensive.

Current Situation

C. Current situation

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

All partner organizations continue using the outputs, especially the epidemiological tools and capacity developed. Partners are now independently seeking further strengthening and adaptation of the output achieved. Epidemiological capacity is currently being promoted in NACA, an inter-governmental in the Asia-Pacific which is playing a major role in capacity building.

Improved diagnostic and control methods from DFID projects are routinely used by partner institutes for the surveillance and further investigation of aquatic animal disease. These include universities, independent veterinary groups working with producers, commercial companies and Government Institutions in the research areas.

The approach used to convert science into farm level disease management practices and ultimately better management practices is being increasingly recognized through the Asian region and globally. Lessons learnt throughout the capacity building process were recently shared at the 1st Global Conference on Aquatic Animal Health held by the World Organization for Animal Health (OIE) and widely recognized.

Aquatic animal health messages and management strategies continue to be adopted by producers in Thailand and Vietnam although processes of updating require to be reinforced to meet continuously changing farming requirements.

*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).***

Epidemiological tools are being used by all the partner institutions especially in Vietnam, Thailand and India. In India, further analysis is being conducted on data collected as part of AFGRP. Two projects implemented in ASEAN countries are targeted at harmonizing national aquatic animal health strategies. This will set an example to promote more widely through the region and elsewhere.

Methods to assess the health of aquatic animals continue being used by the partner organizations. Farmers in Southern Vietnam are adopting practices which benefited from management practices developed through the AFGRP. These comprise mainly of moderate poor farmers, to whom the outputs were targeted.

Diagnostic laboratories have been developed where most of the training was provided through workshops and research projects. National governments increasingly realise that disease diagnosis is important in the provision of high quality aquatic products for the international and national market and seek to invest in the means to provide service for a wide range of aquatic farming systems and needs. This can be advice from a telephone call (Vietnam) to health certification of broodstock (Thailand).

The repository of diagnostic expertise is now in its early stages of operation and is designed to serve people involved with the diagnosis of aquatic animal diseases throughout the Asia-Pacific region.

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

Over the last decade, the importance of aquatic animal health was recognised and spread rapidly within the partner institutions, notably in Vietnam. When AFGRP commenced in CTU and RIA2 only 3-4 people worked on aquatic animal health management. There are now approximately 15 and 50 respectively, reflecting national and market importance.

More widely diagnostic expertise has also developed rapidly, based on AFGRP-related outputs, with increasingly more sophisticated techniques, particularly through the private sector. The use of rapid pathogen identification tools is being combined with enhanced disease management expertise developed within the region over the last decade to provide high quality aquatic animal health services to the industry.

However, while this build up of capacity is very significant and will have major benefits, the need to strengthen and extend this, particularly the newer participatory approaches that can engage smaller-scale producers, is increasingly recognised. The development of more technical expertise in countries with growing economies needs to be matched with local farm-level skills, and where national or local economies are as yet weak, these approaches are even more important. Interest in applying aquatic animal epidemiology also grew rapidly over the years in all the partner institutions. Awareness and uptake of aquatic epidemiology is indeed being developed, but the rate of capacity building did not parallel the growth in capacity in aquatic animal health management, primarily because of relatively limited training inputs given to the institutions involved.

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).***

Over the last decade a network already operating in the Asia-Pacific region was strengthened and played a key role in promoting aquatic animal health disease management. This was to a great extent developed through the DFID funded SE Asian Aquatic Disease and Control Programme (SEAADCP), co-ordinated through AAHRI (Thailand). During this programme a great deal of training through workshops, meetings, studentships etc., was provided to aquatic animal health researchers in SE Asia. This network was instrumental to the promotion and dissemination of aquatic animal health strategies, especially diagnostic techniques and epidemiological tools throughout the Asia-Pacific region.

Over the years, the Network for Aquaculture Centres in Asia Pacific (NACA) has also played a key role in the Asia-Pacific region in the development of platforms for enhancing capacity on aquatic animal health among researchers and government officials. The establishment of a Regional Resource Base made of experts, centres and laboratories and of a mechanism to advise different stakeholders throughout the Asia-Pacific region on aquatic animal health management through the Aquatic Animal Health Advisory Group have been instrumental to capacity building and harmonization of strategies. Similarly NACA played a key role in the conversion of knowledge on aquatic animal health management strategies into BMP, simple and cost-effective practices for the sustainable production of shrimp.

In both Thailand and Vietnam the link between the government, researchers and private sector facilitated the development of need-based research and harmonization of science and policy, although the link with the private sector is often undermined by the lack of effective mechanisms for the dissemination of research findings to the large number of producers involved.

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).***

Aquatic animal health and the application of valid diagnostic and epidemiological tools is currently being promoted through a wide range of mechanisms at both regional and national levels. At the regional level a network of aquatic animal health experts is actively engaged in dissemination throughout the Asia-Pacific region.

In Vietnam, both RIA2 and CTU conduct training activities both directly to farmers and indirectly through aquatic animal health specialists and extension officers. Similarly, in Thailand, AAHRI is actively involved in providing training in aquatic animal health for regional and national aquatic animal health specialists. AAHRI is also actively involved in promoting, both directly through farm visits and indirectly, the implementation of Good Aquaculture Practice (GAP) standards for the responsible production of shrimp. These standards address not only aquatic animal health but also more broadly environmental, social and food safety sustainability issues. All partner organizations are also liaising on a regular basis with NACA to ensure two-way communication between regional and national levels and the updating of aquatic animal tools.

*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)**.*

Capacity is still limited and insufficient to address the diversity of aquaculture species and production systems that characterise the region. Similarly, to address the needs of a continuously evolving sector such as aquaculture, capacity on accurate and valid diagnosis of health problems is still below the actual needs.

In Vietnam millions of producers are involved with shrimp and catfish farming, making information dissemination extremely challenging for the limited extension resources. These concerns are particularly relevant for rural communities, where information is most needed to support the sustainable contribution of aquaculture to food security.

*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).***

Existing mechanisms for capacity and awareness building on aquatic animal health among researchers and government officials should be strengthened. National aquatic animal health networks nested into existing regional networks should be promoted. Continued inputs into training aquatic researchers/field workers in disease diagnosis at all levels is required. Innovative mechanisms such as the internet-based repository of diagnostic expertise (E-Journal) can help address some of the limitations and should be strengthened for their

ability to provide continuous long-term capacity. Innovative mechanisms that have been proven effective for the dissemination of messages to rural communities should also be strengthened. Among such mechanisms, the One-stop Aquaculture Shop Information System (OASIS) piloted in Vietnam and the establishment of farmer groups capable of providing voluntary extension services proved particularly effective at converting science into practices that can cost-effectively be implemented by farmers.

More communication between Governments and research facilities is required if the national aquatic animal health management policies provided are to reflect the current level of understanding in aquatic animal health or disease diagnosis. Interdisciplinary research is needed to ensure that the aquatic animal health messages derived from existing and the future outputs are of the highest benefit to end-users.

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).***

Having a single “one-size-fits-all” approach doesn’t work for the majority of primary producers found in developing regions. Aquatic animal health messages provided in flexible packages will provide the farmers with options and choices from which they can make informed decisions about their farming practise. This ultimately should provide good quality food products and sustainable livelihood options for thousands of farming households. The knowledge generated from combined research and epidemiological studies should be translated into simple packages that farmers are able to adopt.

Continued contact through extension services/farmer networks enables better access and wider uptake to develop faster. Lessons learned from other farmers who have applied management tools and disseminated back to farmer networks significantly enhances the uptake of any aquatic animal health practise or control strategy to be adopted.

A recent Australian project [1] conducted in Indonesia, Thailand and Australia, has shown the effectiveness of working with selected small groups of shrimp farmers for implementing aquatic animal health strategies. The benefit-success achieved by those target groups enhances the uptake of such strategies among neighbouring farmers in a farmer-to-farmer learning process. Experiences from India and Vietnam confirm the validity of this approach and show that implementation of sustainable farming practices by selected groups of producers can ultimately lead to wide uptake of practices throughout countries.

Internet based tools such as the E-journal can play an important role in achieving wide output adoption. In-country travelling workshops can also serve as effective starting points for the development of wider aquatic animal health strategies.

Inter-governmental organizations can provide an effective mechanism to facilitate information sharing and capacity building. Capacity building should be linked to in-country problem solution. The involvement of local institutions in problem solving will ensure ownership and maximise success.

[1] *ACIAR Developemnt and technology transfer on disease prevention in small scale shrimp farmers in Indonesia, Thailand and Australia. AAHRI-Thailand- Dr. Pornlerd Charatchakool. Some of the messages promoted were taken from the research developed by previous DFID projects.*

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.

As shown through structured impact assessment activities, aquatic animal health was only one significant factor to providing sustainable livelihood options.

In 2000-2002 assessments were made of the impact of disease outbreaks in the Vietnamese catfish industry. The work highlighted coping strategies adopted by farmers facing disease outbreaks on their or neighbouring farms.

Assessments of the impact of aquatic animal health messages to the shrimp industry in Vietnam and Thailand were conducted in 2005.

Disease control and prevention measures only offer the chance to estimate the benefit of these approaches when considered against what could have happened. Ensuring aquaculture production can continue without risk of disease reduces the vulnerability of moderate poor farmers and potentially contributes to the prevention of them becoming extreme poor. A report on the challenges of conducting impact assessments was part of this output.

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;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

The most positive impacts observed in Thailand and Vietnam were that aquatic animal health messages raised awareness of key aquatic animal diseases and improved knowledge of the farmers on recognising clinical signs of diseases associated with specific diseases. This knowledge then enabled them to make some choices and decisions which had an impact on their livelihood activities. In Thailand shrimp farmers were aware of the importance of good water quality and supply to grow their shrimp and so converted 70% of their land as water reservoirs for their farms thus reducing the risk of introducing the cause, enabling them to continue with this livelihood activity.

Vietnamese catfish farmers who were able to follow the advice and guidance in disease risk reduction management strategies often had better quality products, did not spend as much on antibiotic treatments therefore had better profit margins and were able to reinvest back into their farm or into another compatible livelihood option.

Although disease outbreaks continue to occur in aquaculture systems, farmers are now more confident in their abilities to cope with these problems. They have better knowledge and understanding in how to recognise and treat/manage a disease outbreak and when to seek help and advice. This has reduced their vulnerability and helped some farmers lessen their debt accumulation. In some areas of Thailand and Vietnam where shrimp and fish farming has continued to be successful this has opened livelihood options and choices for the local rural communities. In some areas of Thailand it has provided village schools and medical facilities and in others it has provided a better source of protein for local people. In Vietnam profits from fish farming have been provided back into the local community and have contributed towards improved roads and transport facilities which are useful for the aquatic seed/feed network but are also of wider benefit to the local community.

Better access to information and knowledge on optimising aquatic animal health has significantly enhanced the livelihood options of rural families. Partners in Vietnam or Thailand confirm that although disease outbreaks still occur farmers know how to minimise impact on crops and report to the competent authority who have strengthened regional capacity in disease surveillance/monitoring. This has contributed, together with the development of accessible markets and appropriate farming techniques, to more families continuing to participate and aquaculture production figures increase at a steady rate. In Vietnam shrimp farming has continued growing steadily over the past decade, showing a 5-fold increase in the period 1999-2004.

It was estimated that about 30,000 poor/landless people were working in catfish farming in 2003. In An Giang province alone 6-7,000 labourers were employed within the Vietnamese catfish production industry, of which a significant number would be within the poor/migrant category. Due to the large scale of the people involved no accurate figures were provided but data generated from the pilot studies indicated that all those involved in Vietnamese catfish farming benefited from a reduction of disease risk and a more sustainable growth of the industry.

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)***

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

Direct benefits to be gained by implementing the AAH strategies produced would include the identification of

emerging aquatic diseases and their potential establishment in water resources and wild populations. Furthermore, uptake of the treatment/control strategies should significantly lessen the irresponsible use of chemicals and drugs being released into the surrounding water bodies thus diminishing any accumulating environmental impacts. Since good water quality is paramount to optimum health and production, environmental degradation is itself adversely affecting wealth and welfare of fish. These are closely linked, therefore aquatic animal health strategies that address diseases using a more holistic approach tend to minimise those impacts and guarantee increased sustainability of the sector. Practical examples of achievable environmental benefits include a reduction in the use of chemicals and antibiotics and accumulation in the environment. Thereby reducing the emergence of antibiotic resistant bacterial strains and reducing nutrient-based pollution of water resources. The inclusion of these holistic strategies into government policies through interaction at the regional and national level will allow the wide adoption of the outputs.

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

No, there do not appear to be any adverse environmental impacts associated with the adoption of the output.

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)***

Yes. Effective aquatic animal health management strategies can potentially offer the producer the chance to produce food in a more controlled, and potentially shorter, period of time and allow adaptation to new species that may need to be farmed.

Annex

ANNEX 1 Executive summary of the "2005 Progress Report of the MPEDA/NACA Project on BMP implementation in shrimp farms in India"

As a part of the technical collaboration between MPEDA and NACA on shrimp disease control in India, village demonstration programmes were conducted during the years of 2002, 2003, 2004 and 2005 (Fig.1). These demonstration programme involved organizing small-scale farmers into self-help groups known as "Aquaclubs" for adoption of "Better Management Practices". The project has been highly successful in bringing together shrimp farmers (organized into aquaclubs) to collectively implement better management practices to reduce disease-related losses, cost of production, improve yields and produce quality, antibiotic-free, traceable shrimp. In 2005 the program was extended to total of 18 villages and 19 Aquaclubs in three Indian states (Andhra Pradesh, Gujarath and Karnataka). A total of 736 farmers with 1187 ponds in 663 ha were involved in the programme. In 2005, 672 tons of BMP shrimp was produced by all the aquaclubs.

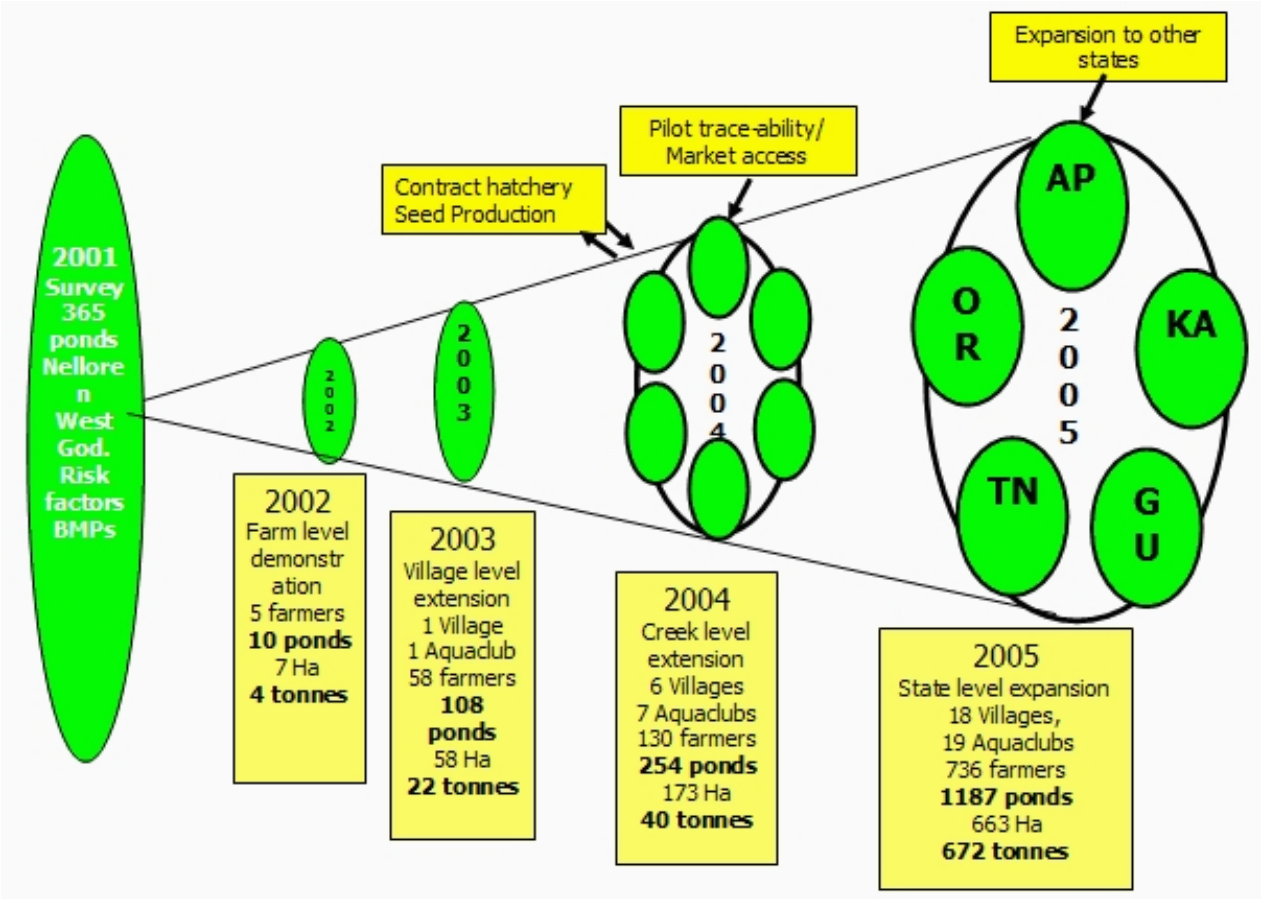
The BMP implementation was successfully carried out at (a) Mogalthur and 14 surrounding villages of Andhra Pradesh during January to August 2005 (b) Hingraj and Samapur villages of Gujarath state and (c) Kundapur village of Karnataka. The MPEDA/NACA program facilitated formation of 15 Aquaclubs in 14 villages in Andhra

Pradesh and 5 Aquaclubs in 4 other states; Karnataka, Gujarat, Orissa and Tamil Nadu. In Andhra Pradesh 635 farmers (930 ponds) produced 482 tons of shrimp. The crop results from 930 demonstration ponds spread over 484 hectares of area in 15 aquaclubs of Andhra Pradesh showed an increase in production by two-fold, 34% increase in size of shrimp, 15% increase in crop duration, 68% improvement in survival and 65% reduction in disease prevalence when compared to surrounding non-demonstration ponds. As a result, for every 1000 rupees ($ 22) invested, demonstration farmers made a profit of 128 rupees ($2.9), while non-demonstration farmers made a profit of only 38 rupees ($ 0.86). In Gujarath 88 farmers (242 ponds) produced 190 tons of shrimp. On an average, the shrimp yields were 1128 kg/ha and 1031 kg/ha in Andhra Pradesh and Gujarath respectively In Karnataka 13 farmers (15 ponds) participated in demonstration programme to implement the BMPs.

The study team organized weekly farmer meetings and pond visits, and facilitated exchange of experiences to farmers in other farming areas. In Village demonstration ponds production was 2 times more than that in non-demonstration ponds. This was mainly due to better survival rates in demo ponds than non-demo ponds. And also there was a significant decrease in prevalence of diseases over last one year, which helped the production levels to increase. In demo ponds it decreased from 36% in 2004 to 15% in 2005. Successful implementation of BMPs led to decrease in disease prevalence and increase in planned (normal) harvests leading to betterment in overall crop outcomes.

The farmers were very pleased with the production they achieved and the reduced risks of disease. Mogalthur and surrounding shrimp farming villages in Andhra Pradesh were being continuously affected by diseases till 2001. Only in later years with the involvement of the MPEDA-NACA project, the farmers there realized the benefits of the BMP programme. Now there is substantial visible change in the attitude of the farmers and as result significant improvements in the production has been accomplished. Farmers are keen to continue participating in the programme. More farmers from neighboring areas want to adopt BMP’s in their farms in 2006. The remarkable achievement of 2005 shrimp health management program in India was a significant reduction in disease incidence among different categories of stocking densities (< 40000 to >70000 per hectare). The only disappointment among farmers was the lower price of the shrimp in 2005 compared to that of 2004. The average price of 30 count shrimp in 2004 was Rs. 260, while it was Rs. 220 for the same count in 2005.

Fig. 1 MPEDA-NACA Program progress in last five years.



2001 - Survey was conducted in 365 ponds in Nellore and West Godavari Districts of AP to asses risk factors.

2002 - Technical assistance on 'Shrimp Disease Control and Coastal Management' -5 farmers, 10 ponds.

2003 - “Village demonstration” was successfully conducted in Mogaltur village of West Godavari in Andhra Pradesh.

2004 - Upon the demands from farming community, which was an indication of the success of the program, the MPEDA and NACA decided to continue the Village demonstration program.

2005 - Program was extended to cover Gujarath, Karnataka, Tamilnadu and Orissa.