REDUCING THE RISK OF AQUATIC ANIMAL DISEASE OUTBREAKS and IMPROVING ENVIRONMENTAL MANAGEMENT OF COASTAL AQUACULTURE IN VIET NAM

Final report of the NACA/SUMA projects FSPS I

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EXECUTIVE SUMMARY

Background

During the past 10 years, Viet Nam witnessed an outstanding 3-fold increase in aquaculture production, going from 374,000 mt in 1993 to 1,150,000 mt in 2003, and a 2-fold increase only in the 5-year period 1998-2003. Shrimp farming played a major role in this rapid development, with a production that only in the 5 year period between 1998 and 2003 experienced a 4-fold increase reaching over 220,000 mt and that according to national statistics grew constantly to reach an estimated 350,000 mt in 2005.

This sharp increase in production came at a cost. Escalating environmental deterioration and the associated shrimp health problems began to damage the sector. Farmers responded to these health issues by increasing the use of chemicals, involving sometimes the application of banned substances, which led importing countries to impose restrictions on Vietnamese aquaculture products and most likely resulted in a negative impact on the livelihood of farming communities.

The government of Vietnam promptly recognized the need for promoting a more sustainable development of the sector and initiated several activities in this direction with the support of the Danida-funded SUMA (Support to Brackish water and Marine Aquaculture) component of the Fisheries Sector Programme Support (FSPS) and of the Network of Aquaculture Centres in Asia-Pacific (NACA).

Over the last 2 years, 2 complementary projects were implemented by NACA through SUMA. These projects were aimed at developing strategies for reducing the risk of aquatic animal disease outbreaks and supporting the development of Environmental Impact Assessment (EIA) and Code of Practice for brackishwater and marine aquaculture. Through these projects the experiences gathered from other countries in the Asia-Pacific region were used to tackle aquatic animal disease and environmental problems and to **support the sustainable development of the aquaculture sector in Viet Nam**.

Methodology

The projects were implemented by conducting activities at all levels and with the strong collaboration of the Ministry of Fisheries (MOFI), Departments of Fisheries (DOFI), Research Institutes for Aquaculture (RIA), Universities, hatcheries, traders and farming communities to ensure a successful outcome of the work conducted.

The 3 main players in the implementation of these projects were the Government of Viet Nam, NACA and the Danish government. A project team was established to coordinate project activities.

The role of the project team was to collaborate with SUMA and other FSPS components in supporting the Vietnamese stakeholders to achieve sustainable aquaculture development through the implementation of the project activities. The project was implemented paying particular attention to timeliness and feasibility of activities , relevance of activities and methods, acceptance of activities and methods by stakeholders, capacity building, sustainability, increased role of Vietnamese stakeholders and cost-effectiveness of the strategies adopted.

Activities were integrated as much as possible with other SUMA activities, other FSPS components and activities conducted by projects and programmes outside FSPS and were subjected to a continue process of monitoring and evaluation

The project was supported financially entirely by the Danish government through the SUMA component, although the MOFI National Fisheries Quality Assurance and Veterinary Directorate (NAFIQAVED) provided the NACA team with office space and utilities within their facilities in Ha Noi.

Achievements

The achievements made during the implementation of the projects concern mainly:

- Reducing risk of diseases from seed
- Reducing risk of diseases in farms
- Developing capacity at provincial-level
- Developing an effective surveillance system
- Developing capacity at national-level
- Wide dissemination of experiences

Reducing risk of diseases from seed

The target was to provide support to reduce the risk of introducing pathogens to hatcheries, farms and provinces through the seed. Assessment of the current status of seed production in Viet Nam identified problems with: the system used for screening and certification of seed; poor biosecurity and health management practices throughout the seed production chain from broodstock traders to farmers; very limited disease testing for dangerous pathogens.

To overcome these issues, Better Management Practices (BMP) were developed for all links in the production chain, i.e. broodstock traders, hatcheries, seed traders and farmers. Extension material was developed and disseminated. Implementation of BMP for hatcheries was supported in 6 hatcheries and resulted in seed production up to 1.5 times higher and a price per unit seed of about 30-40% higher than non-BMP seed. The project BMPs were also incorporated into the draft standards for the production of organic seed. The implementation of BMP for farmers indicated that farming communes that introduced seed testing as part of their practices had a chance of making a profit over 7 times higher.

The project also supported strengthening of institutions involved with seed health management by conducting training courses and by supporting the development of national and provincial-level legal documents to improve the process of seed screening and certification.

In view of the potential risk of pathogen transmission associated with feeding live hermit crabs to broodstock, the project supported activities to develop polychaete worm farming and experimental trials for farming and reproduction of polychaetes are now successfully being conducted at the Nha Trang Fisheries University.

Because of the importance of White Body Disease declared by hatchery managers across the whole country, the project collected expertise on this disease throughout Viet Nam and a number of epidemiological studies entirely supported by local institutions are now being conducted

Reducing risk of diseases in farms

The target was to develop, disseminate and implement strategies to reduce the risk of aquatic animal disease outbreaks in farms. An assessment of the current situation highlighted issues related to poor collaboration between farmers, the adoption of inadequate practices during pond preparation, stocking, water and feed management and management of health problems and poor record keeping.

To respond to these shortcomings, the project developed simple and practical BMPs which addressed the needs also of less resourced small-scale farmers. Extension material incorporating BMP was produced, first by the project team and later by MOFI for a nation-wide promotion of more sustainable practices. BMP implementation was supported in 7 pilot farming communities (655 direct beneficiaries) in northern central Viet Nam. Implementation led to a remarkably lower risk of mortality, higher production and higher probability of making a profit, with average yields sometimes more than 4 times higher if BMPs had been applied.

The development of farmer groups and the establishment of a voluntary extension system within the farming community were also encouraged. In addition, the project supported one of the communes to develop a document aimed at self-regulating farming activities and incorporating BMP concepts.

Several activities aimed at developing and disseminating BMP for marine fish culture were conducted through the project. A set of BMP for marine fish farming in cages were designed to implement the "International Standard for the Trade of Live Reef Food Fish". As a result, BMP guidelines were developed and are now being finalized.

Through the project, 2 extension booklets produced as part of a NACA/Australian Centre for International Agricultural Research (ACIAR) project and aimed at implementing more responsible mariculture were translated into Vietnamese and a booklet on small scale hatchery technology have been printed and will be disseminated to hatcheries interested in marine fish seed production through the provincial Fisheries Extension Centres within the next few weeks.

In order to support the implementation of BMP by farmers, the project team also attempted to identify market opportunities for BMP products and initial steps have been taken in this direction including supporting the establishment of a certification scheme for BMP/Good Aquaculture Practice (GAP) products and contacting European retailers in an attempt to increase the market opportunities for better quality products and potentially obtain a better price.

Developing capacity at provincial-level

The project team conducted several activities aimed at improving the capacity of provincial, district and local institutions to manage the risk of disease outbreaks. This objective was achieved through continuous interactions at all levels.

Farmers and extension workers were trained on several occasions on diagnosing health problems from the pond side and on suitable responses to the recognized problems. In addition, volunteer extension workers (43) and extension workers (30) were provided with basic equipment to support the diagnosis of health problems.

Capacity on the use of Polymerase Chain Reaction (PCR) for the detection of White Spot Syndrome Virus (WSSV) was also developed. The project supported training on PCR for 3 provinces and discussion on how to improve PCR diagnostic capabilities was also conducted in other 2 provinces. One laboratory for the detection of dangerous viral pathogens was established in Ha Tinh province. Moreover, 2 other laboratories are being established in Khanh Hoa and Ca Mau provinces through the joint financial support of DOFI and SUMA.

Support was provided to raise awareness and to build capacity in EIA through two training courses and at workshops on environmental management and development of the EIA guidelines.

The project also supported provincial DOFIs during the development of 3 legal documents.

Developing an effective surveillance system

A thorough assessment of the situation indicated that, although some information on disease occurrence is collected regularly, there are several concerns about the timeliness and accuracy of the information collected. These constraints prevent the implementation of a rapid, synergic and appropriate response to health problems.

A system to address the above issues was designed during several consultations which involved both fisheries and livestock stakeholders. The system was piloted with some variation in a total of 34 communes over 5 provinces: Nghe An, Ha Tinh, Quang Ninh, Khanh Hoa and Ca Mau.

Information was to be collected from 20 ponds per commune and, to enable this process, training courses at all levels were conducted. Information collected by commune extension workers was to be recorded onto a recording sheet and sent in the form of a coded SMS, which could be recorded directly on a centralized database. Once sent, information was then to be made accessible to provincial and district stakeholders and a harmonized response to the information was to be taken.

As a result all the 5 provinces in which the system was piloted recognized the usefulness of having a surveillance system. Both normal and abnormal information was successfully collected. The quality of the information appeared generally good. A final evaluation of the system indicated that only 3% of the commune officers in charge of collecting and sending the information had difficulties in transferring the pond-side observations into the provided recording sheet. On the contrary, all the commune extension workers in all the 5 pilot provinces declared that the Information and Technology (IT) system put in place did not give adequate feedback. Similarly, all the 5 pilot provinces lamented delays in the establishment of a website to access information from the system and difficulties while assessing that information. In addition, 3/5 provinces faced problems related to an allegedly poor network system, with one province having to use a telephone connection to be able to access the information through the internet. The above technical issues, which often hampered the prompt response to emergencies, were communicated to the responsible Strengthening of Fisheries Administration (STOFA) component. The project team is also currently supporting MOFI to explore alternative approaches.

Developing capacity at national-level

With the support from the project and regional and international experts, a National Advisory Committee for Aquatic Animal Health (NACAAH) was established. This represents a major step towards the development of a harmonized aquatic animal health management strategy. The committee was praised on several occasions by international aquatic animal health specialists is now financially self-sustaining.

Capacity was built by supporting on 31 instances the attendance of key figures in Vietnamese aquaculture to a range of regional and international events. Support of national-level stakeholders was also achieved by building capacity on the diagnosis of emerging diseases in the region. To achieve this, a close collaboration with Asia-Pacific Regional Resource Experts (RRE) on aquatic animal health was pursued and obtained.

Benefiting from the involvement in the project of the RRE in aquatic epidemiology, capacity on this subject was built in several Vietnamese institutions. The development of capacity in aquatic animal disease diagnostics was also supported by assisting NAFIQAVED to translate into Vietnamese and print the "Asian Diagnostic Guide to Aquatic Animal Diseases", a key document for aquatic animal health officers in the region.

Because aquatic animal health management can only be achieved if its links with different areas of expertise are fully considered, the project supported MOFI in a number of activities targeting responsible aquaculture development, including giving support for the participation of MOFI staff to discussion on the development of the international principles for responsible shrimp farming.

Support was also given to the development of both regulations and extension material supporting the implementation of better management practices for shrimp and marine fish.

To address the controversial issue of farming the exotic *Penaeus vannamei* in Viet Nam, a major workshop to share opinions on *P. vannamei* farming and allow MOFI to take an informed decision towards farming of this species was organized and resulted in the formulation of MOFI policy towards P. vannamei culture.

The project also supported MOFI in its efforts to develop coastal aquaculture planning guidelines, an effective tracing and tracking system and a fisheries extension strategy.

Support was given to the development of the legal framework necessary for the effective implementation of sustainable aquaculture strategies and assistance in this direction was given to the development of 8 legal documents

In addition, support was provided for the development of 2 sector standards on conditions for food safety and sanitation assurance for shrimp farms and shrimp farming zones.

Environmental Impact Assessment guidelines were also developed and are expected to be approved in the nearest future

Wide dissemination of experiences

The project experiences were widely disseminated within Viet Nam and internationally.

Experiences were disseminated within Viet Nam mostly at meetings and workshops. In addition to regular meetings with MOFI and DOFI personnel, the project experiences were presented at 5 national workshops which were all well attended by national and provincial-level stakeholders.

In addition, information on the project achievements were incorporated into the many presentations delivered within Viet Nam to share experiences gathered through the SUMA component.

Over the period of the projects, 8 presentations were delivered at 6 international workshops or meetings. Seven of these were invited by the event organizers, showing the deep interest internationally on the project activities and achievements.

With the contribution of the above dissemination activities, Viet Nam's efforts towards sustainable aquaculture are now widely recognized and several countries are eager to learn from Viet Nam's experience.

The Way Forward

A major focus of the projects was towards sustainability. As a result, thanks to the commitment of all the stakeholders involved, most activities conducted during these 2-years will continue or serve as starting point for future developments. This will be in part assisted by the fact that two of the 3 Vietnamese project team members will continue their efforts towards BMP implementation by working within the MOFI system. The third staff will continue working for NACA.

Pilot farmers and local authorities have declared on several occasions their intention to continue BMP implementation and are requesting MOFI support to supervise these efforts. At the national level, there are strong signals of MOFI willingness to take the achievement of the NACA/SUMA projects forward.

In spite of all these positive signs, a lot still needs to be done. The Vietnamese aquaculture sector has to respond to increasingly stringent market requirements that threaten the livelihood of less resourced small scale farmers. Although the implementation of better practices in a wider scale will benefit from the extension material and regulations developed through the projects, sustainable implementation is dependent on the development of harmonized supporting systems such as an effective surveillance and response system and a simple traceability system which allows the compliance also by small scale producers. The work on disease also needs to be extended to a more effective environmental surveillance system. In addition, a mechanism to monitor the impact of these systems on the livelihood of aquaculture farmers should be established.

To achieve the above, stronger collaboration with regional institutions should be encouraged. MOFI has already recognized the benefits of receiving inputs from organizations such as NACA and Asia-Pacific Advanced Networks (APAN), which can share the regional experiences in sustainable aquaculture and IT respectively. The newly approved 2nd Phase of the Danida-funded FSPS opens a major opportunity for Viet Nam to continue its efforts towards the sustainable growth of the fisheries sector and NACA is strongly committed to supporting Viet Nam to achieve this target.

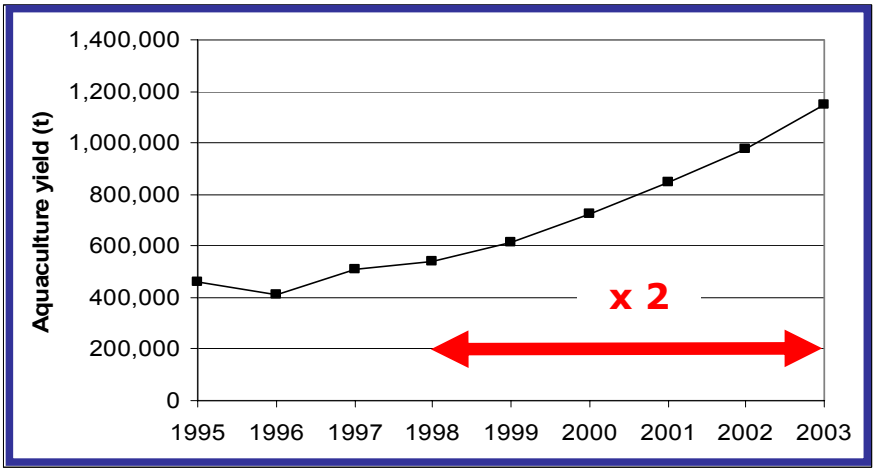

Quang Ninh
Nghe An
Ha Tinh
Khanh Hoa
Ca Mau

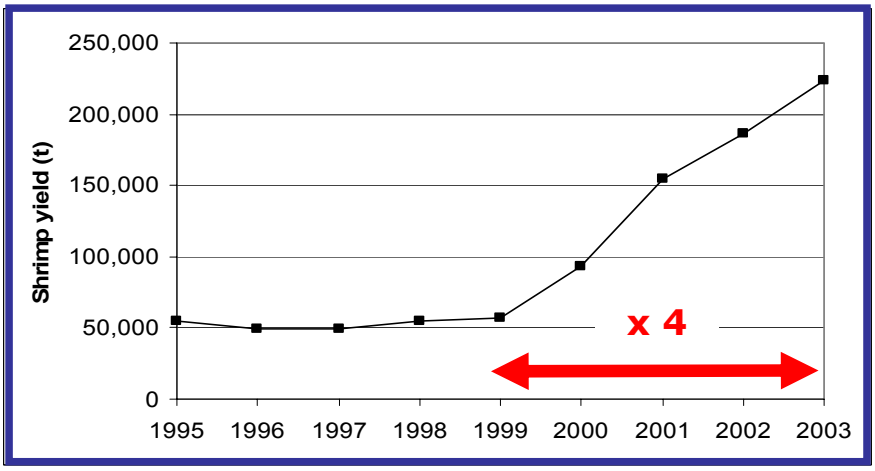
LIST OF ABBREVIATIONS

ACIAR	Australian Centre for International Agricultural Research
AFFS	Aquaculture Farmer Field School
APAN	Asia-Pacific Advanced Networks
ARP	Aquatic Resource and Protection
BMNV	Baculoviral Midgut-gland Necrosis Virus
BMP	Better Management Practice
CoP	Code of Practice
DARD	Department of Agriculture and Rural Development
DOFI	Department of Fisheries
FAO	Food and Agriculture Organization of the United Nations
FSPS	Fisheries Sector Programme Support
GAP	Good Aquaculture Practice
MARD	Ministry of Agriculture and Rural Development
MBV	Monodon Baculovirus
MOFI	Ministry of Fisheries
NACA	Network of Aquaculture Centres in Asia-Pacific
NACAAH	National Advisory Committee of Aquatic Animal Health
NAFEC	National Fisheries Extension Centre
NAFIQAVED	National Fisheries Quality Assurance and Veterinary Directorate
OIE	Office International des Epizooties (World Organization for Animal Health)
PCR	Polymerase Chain Reaction
PL	Post-larvae
RIA	Research Institute for Aquaculture
RRE	Regional Resource Expert
SEAFDEC	Southeast Asian Fisheries Development Center
SIPPO	Swiss Import Promotion Programme
SSD	Swollen Siphon Disease
STOFA	Strengthening of Fisheries Administration
SUFA	Support to Freshwater Aquaculture
SUMA	Support to Brackish Water and Marine Aquaculture
TCP	Technical Cooperation Programme
TG	Technical Guidelines
UNEP	United Nations Environment Programme
WB	World Bank
WBD	White Body Disease
WSD	White Spot Disease
WSSV	White Spot Syndrome Virus
WWF	World Wildlife Fund

1 BACKGROUND

During the past 10 years, Viet Nam witnessed an outstanding 3-fold increase in aquaculture production, going from 374,000 mt in 1993 to 1,150,000 mt in 2003, and a 2-fold increase only in the 5-year period 1998-2003. Shrimp farming played a major role in this rapid development, with a production that, according to data from the Food and Agriculture Organization of the United Nations (FAO), only in the 5 year period between 1998 and 2003 experienced a 4-fold increase reaching over 220,000 mt and that according to national statistics grew constantly to reach an estimated 350,000 mt in 2005.





Although continuously higher production could be an indicator of the healthy growth of the sector, the increased production observed in recent years was due more to an increase in the number of farms, than to improved productivity.

This sharp increase in production came at a cost. Escalating environmental deterioration and the associated shrimp health problems, which in 2004 led to an estimated loss of 11% of the total shrimp production, began to damage the sector. Farmers responded to these health issues by increasing the use of chemicals, involving sometimes the application of banned substances, which led importing countries to impose restrictions on Vietnamese aquaculture products

and most likely resulted in a negative impact on the livelihood of farming communities.

The government of Vietnam promptly recognized the need for promoting a more sustainable development of the sector and initiated several activities in this direction.

Since November 2003, the Network of Aquaculture Centres in Asia-Pacific (NACA), through the Danida-funded SUMA (Support to Brackish water and Marine Aquaculture) component of the Fisheries Sector Programme Support (FSPS), began supporting the Vietnamese government in these efforts. This was achieved through a project titled "*Reducing the risk of aquatic animal disease outbreaks: pilot project in Ca Mau, Nghe An, Ha Tinh, Quang Ninh and Khanh Hoa coastal provinces*" and a complementary project "*EIA and Code of Practice for shrimp and brackishwater and marine aquaculture, planning and support*" Through these projects the experiences gathered from other countries in the Asia-Pacific region were used to tackle aquatic animal disease and environmental problems and to support the sustainable development of the aquaculture sector in Viet Nam.

The immediate objective of the disease control project was to:
Develop and implement practical and workable disease control systems in five pilot provinces

This objective was to be achieved through 6 outputs:

Output 1: Risk reduction measures in place for shrimp post-larvae

Output 2: Improved farm level risk management practices

Output 3: Improved capacity of provincial institutions in risk management

Output 4: Effective aquatic animal disease surveillance system in place in pilot provinces

Output 5: Communications and information exchange on better health management practice

Output 6: Support national level efforts to control aquatic animal disease outbreaks[1]

The terms of reference and a more detailed description of the project and can be found in Annex A.

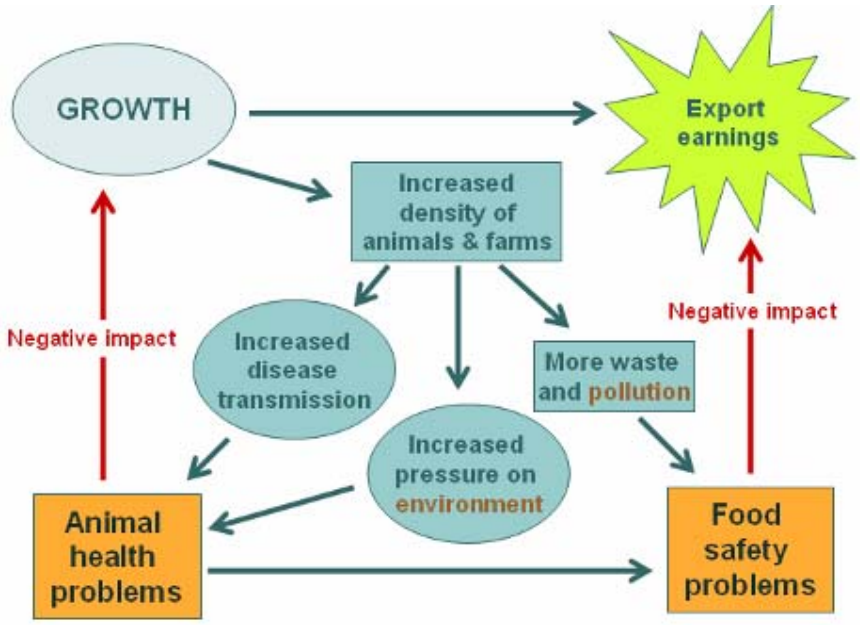
The immediate objectives of the EIA project were in summary to:

1. **Finalise EIA guidelines and develop practical supporting material to assist their implementation.**
2. **Finalise Code of Practice (CoP) for sustainable shrimp aquaculture and develop a Code of Practice for marine fish farming.**
3. **Assist in SUMA planning**
4. **Support dissemination of aquaculture knowledge and research results.**

Although the disease project was initiated with a focus on aquatic

[1] Output 6 represents an expansion of the original workplan and was added after the beginning of the project to ensure a wider impact of the project across Viet Nam.

animal health, because of the close links between aquatic animal health, environment, food safety and socio-economical sustainability, the approach used was to target sustainable aquaculture development in a broader sense. The EIA project was therefore complementary to the disease control project, providing broad support to sustainable development of brackishwater and marine aquaculture in Vietnam.



A major focus of the projects was to increase the sustainability of the shrimp farming sector. However, several activities were conducted also to support the responsible farming of other aquatic organisms. In addition, the approach used was designed to be applicable also to other commodities.

In this document the experiences gathered through the projects are presented with the objective of posing the basis for future activities.

2 METHODOLOGY

The projects were implemented by conducting activities at all levels and with the strong collaboration of THE Ministry of Fisheries (MOFI), the provincial Departments of Fisheries (DOFI), Research Institutes for Aquaculture (RIA), Universities, hatcheries, traders and farming communities to ensure a successful outcome of the work conducted.

2.1 The Players

The 3 main players in the implementation of these projects were the Government of Viet Nam, NACA and the Danish government. Viet Nam is one of the 17 country members of NACA and the partnership between Viet Nam and NACA has a 2-decades long history. Viet Nam has also been a key target of the Danish development efforts and a major programme to support the development of the fisheries sector in Viet Nam (FSPS Phase 1) was initiated in the year 2000.

The projects described in this document were conducted through the SUMA component of the FSPS Phase 1 programme, and benefited from the long term commitment of the 3 partners involved.

A project team was established to coordinate project activities. This team included the following people:

Dr. Michael Phillips (NACA). Mike is an environmental specialist and is the head of the Research and Development programme of NACA. He has been supporting Viet Nam for more than 15 years, providing technical assistance and sharing experiences generated through the NACA network, and especially projects conducted in India, Thailand, Indonesia and other countries in the region.

Dr Flavio Corsin (NACA). Flavio is an aquatic animal health specialist with broad experience in Vietnamese aquaculture. He started working in Viet Nam in 1997 and, after some years during which he continued his contribution to activities in the Asian region, he decided to return to Viet Nam to support the development of aquaculture through this project. Flavio is also a Regional Resource Expert (RRE) in Aquatic Epidemiology.

Dr C.V. Mohan (NACA). Mohan has wide experience on aquatic animal health in the region and he has been managing the Aquatic Animal Health Programme of NACA for the past 2.5 years. His involvement with shrimp health issues in Viet Nam also started almost a decade ago and it is likely to be increased further in following years as part of this and other projects.

Dr Pornlerd Chanratchakool. Pornlerd is the author of the very popular book "Health Management in Shrimp Ponds", which has been translated in several languages including Vietnamese. He has been working in shrimp health management for more than 15 years. He was also involved as a health management specialist in several projects in collaboration with several international institutions such as NACA, ACIAR (Australian Centre for International Agricultural Research), FAO, DFID and DANIDA.

Dr Matthew Briggs. Matt is a hatchery expert who has been working with shrimp hatcheries all over the world for 20 years. He has been working in Vietnamese shrimp hatcheries as a consultant for the past 3 years and is currently consulting for a number of large hatcheries implementing Better Management Practices (BMP).

Mr Pham Van Khang (RIA1). Khang is an aquatic animal health specialist with 5 years of experience in this field. He is a permanent staff of RIA1 but has been supporting NACA's activities for the past 2 years playing a key role in the implementation of the project. Before joining the project his expertise was mainly on diagnostic testing and partly on field work. The project provided him with an opportunity to share with farmers and local authorities his expertise on aquatic animal health management.

Ms Nguyen Hai Ha (SUMA). Hai Ha was employed as secretary cum interpreter to assist the project implementation. Her abilities however soon required a shift in her duties to cover also the socio-economical aspects of the strategies towards sustainability that were supported through the project.

Ms Nguyen Thi Phuong Mai (SUMA). Mai is a shrimp hatchery specialist who has been involved in the shrimp industry for 15 years. Her experience as a hatchery manager was a great asset during the development of practical aquatic animal health control strategies.

Several other people collaborated to the project implementation. In fact the project was implemented in strong collaboration with other SUMA staff and by collaborating with people involved in other FSPS components such as Support to Freshwater Aquaculture (SUFA) and Strengthening of Fisheries Administration (STOFA).

The role of the project team was to support the Vietnamese stakeholders to achieve sustainable aquaculture development through the implementation of the project activities. The experience of the project team in the Asia-Pacific region ensured that Viet Nam could benefit from the lessons learnt in other countries.

Several people within the Vietnamese system played an important role in the project implementation. Among these, the following should be mentioned for their outstanding role:
Vice-Minister Dr Nguyen Viet Thang
Mr Nguyen Tu Cuong (NAFIQAVED)
Dr Nguyen Xuan Ly (Department of Science and Technology)
Dr Nguyen Van Thanh (Department of Aquaculture)
Mr Tran Van Quynh and *Mr Bui Huy Dien* (NAFEC)
Dr Le Thanh Luu and *Ms Phan Thi Van* (RIA1)
Dr Nguyen Van Hao (RIA2)
Ms Nguyen Thi Xuan Thu (RIA3)
Dr Tran Van Thanh and *Mr Le Van Huong* (DOFI Nghe An)
Dr Tran Van Lieu and *Ms Dang Thi Thuy Hoan* (DOFI Ha Tinh)
Mr Nguyen Van Duyen (DOFI Ca Mau)
Ms Nguyen Thi Hoa and *Ms Tran Thanh Thuy* (DOFI Khanh Hoa)
Mr Dinh Trong Ly (DOFI Quang Ninh)

Drs Nguyen Huu Dung and *Do Thi Hoa* (Nha Trang Fisheries Univ.)
Dr Nguyen Thanh Phuong (Can Tho University)

As stated above, the project relied solely on regional or national expertise. Regional expertise was provided only when no national expert on a specific subject could be identified.

2.2 The approach

Key considerations

The project was implemented paying particular attention to the following:

- *Timeliness*. Health and environmental problems are generally characterized by a high degree of urgency often due to the huge losses that they cause. For this reason, under the guidance of a wide range of stakeholders, the project aimed at providing rapid and effective responses to those problems.
- *Feasibility*. Only activities that were considered feasible by a wide spectrum of stakeholders were undertaken. This was particularly important when designing Better Management Practices to be implemented by small-scale producers, whose possibilities were often restricted by limited resources.
- *Relevance of activities and methods*. This was ensured by conducting stakeholders consultations throughout the project
- *Acceptance of activities and methods by stakeholders*. Because of the relevance of the issues tackled by the project, the activities were accepted by the stakeholders involved and on some occasions, they were taken over and expanded by the stakeholders themselves.
- *Capacity building*. This was considered essential to allow the sustainability of the project activities and it was successfully achieved at all levels, from producers to local and national stakeholders
- *Sustainability*. The project was conducted devoting a great deal of effort into ensuring that activities initiated would have a natural continuation beyond the project completion. With similar intentions, when infrastructures were purchased, these were selected considering, ease of operation and availability of technical support and spare parts.
- *Increased role of Vietnamese stakeholders*. To maximize the sustainability of the activities, project input was given only when considered essential and preference was given to conducting activities with the strong participation and ownership by stakeholders in the Vietnamese system. The high degree of integration of project activities is witnessed by the fact that Output 7 was the only SUMA output entirely based within one of the MOFI departments, i.e. the National Fisheries Quality Assurance and Veterinary Directorate (NAFIQAVED).
- *Cost-effectiveness*. To allow the sustainability of the activities and the extension of the lessons learnt to geographical areas not directly involved with the project, costs and benefits were carefully weighed.

Pilot activities versus wider involvement of stakeholders

Project activities were initiated at a pilot scale to benefit from the already ongoing efforts undertaken by the SUMA component, to

allow more targeted efforts and a better assessment of the feasibility of the advised practices. The latter was particularly important in view of the fact that this project, together with NAFIQAVED efforts, pioneered the application of Better Management Practices (BMP) and Good Aquaculture Practices (GAP) in Viet Nam.

In view of the high number of *Penaeus monodon* shrimp hatcheries in Vietnam, which according to MOFI statistics reached 5,094 in 2004, a pilot-based approach was also used to initiate hatchery-level activities.

The use of pilots, however, was considered only an entry-point for interventions. In fact, wider involvement of stakeholders was sought, and often achieved, by conducting activities also at the national and provincial level. A clear example of this is the incorporation of BMP into the national level regulation developed by NAFIQAVED, an activity that will have a positive impact on all the shrimp farmers of Vietnam (see 3.5).

Capacity building

Training needs were assessed through a range of meetings with the trainees and using unstructured questionnaires. Since activities were conducted in pilot communes, this assessment was carried out often involving directly the targets of the training. Training was generally considered a long-term activity and attempts were made to deliver training on complementary topics to the same people who had been originally selected from a stakeholder group. Training conducted under both projects covered a broad range of activities, and stakeholders, from practical farm level training to training for government officials.

Capacity building was also carried out by supporting attendance of key stakeholders to high profile conferences and workshops. The selection of the stakeholder was based on the following:

- Relevance of the event to the participants' responsibilities
- Interest in the event by the participant
- Likelihood of long-term involvement of the participant within the system

Attendance of stakeholders to conferences was often followed up by activities during which the experiences gained during the event could be effectively put into practice.

Stakeholder consultations

Stakeholder consultations were conducted during field visits, at regular meetings and by circulating relevant documents to stakeholders and eliciting comments. The experience or producers (e.g. farmers and hatchery managers) and traders (e.g. seed middlemen and broodstock suppliers) was highly valued to assess the relevance and feasibility of the approaches adopted. Consultation with stakeholders highlighted the issues that needed to be addressed by the project.

Linking with other FSPS activities

Activities were integrated as much as possible with other SUMA outputs and FSPS components. This was conducted through regular

email updates, at meetings and by conducting collaborative activities. The many activities conducted in collaboration with the SUFA and STOFA components (e.g. surveillance, disease testing etc.) are a clear example of this effective cooperation.

When effective linking was not achieved, project activities were synergic to ongoing efforts within the whole programme.

Linking with projects and programmes outside FSPS

Project activities were generally well linked with ongoing activities conducted by projects and programmes outside FSPS.

As an inter-governmental organization, NACA is involved with several activities in Viet Nam and other countries in the region and this eased integration with other ongoing efforts. Effective linking was also possible because of the receptive and proactive attitude of the project team.

This effective integration, not only benefited the project activities by providing a wide range of lessons learnt, but also allowed a more widespread dissemination of the project experiences and efforts conducted.

The Disease and Environment Surveillance System: an Example of Effective Integration

One example of the successful integration of the project with other ongoing activities can be seen by looking at process through which the disease and environment surveillance system was developed.

The project team worked in close collaboration with other components within the FSPS programme, namely with SUFA, which managed the piloting of the surveillance system in freshwater environments, and STOFA, in charge of developing solutions for the transferal of the information.

The surveillance system was developed in collaboration also with projects and programmes outside FSPS. In fact, the Danida-funded Agriculture Sector Programme Support (ASPS) and the NGO Veterinarians Sans Frontiers (VSF) played an important role in providing experiences gathered from the livestock sector.

2.3 Monitoring and evaluation

The progress of the project was monitored regularly using both unstructured and structured questionnaires. Evaluation was conducted generally at stakeholder meetings or workshops, where redirection and improvements of the project were considered and if necessary planned for future implementation.

An assessment of the project through the examination of activities reported in the 2004 and 2005 work-plans is reported in Annex B.

Indicators of achievement following the SUMA/FSPS guidelines were also adopted. Details can be found in the reports produced by SUMA throughout the project duration and in the SUMA Component Completion Report contained in the attached CD.

Wherever possible, standard statistical tests (e.g. Chi square and t-test) were also used to assess the efficacy of the approach used beyond chance.

2.4 Financial support

The project was entirely supported through the SUMA component, although the National Fisheries Quality Assurance and Veterinary Directorate (NAFIQAVED) provided the NACA team with office space and utilities within their facilities in Ha Noi. Because the scope of the health project was expanded significantly from what originally planned (e.g. addition of Output 6, etc.) and a range of new activities had to be conducted, in the 2nd year additional funds were committed by the SUMA component for project implementation. A detailed financial report is available with SUMA management.

3 ACHIEVEMENTS

3.1 Reducing risk of diseases from seed

The target was to provide support to reduce the risk of introducing pathogens to hatcheries, farms and provinces through the seed.

The current situation

Assessment of the current situation regarding the risk of diseases coming from the seed was conducted in Khanh Hoa, Ca Mau, Nghe An and Ha Tinh provinces by interviewing DOFI, ARP (Aquatic Resource and Protection) staff, farmers, hatchery managers and seed and broodstock traders. Hatchery visits were also conducted throughout the project and were aimed at collecting information on the management practices adopted and on ways to improve hatchery performance. Information concerning hatchery practices in Ca Mau was also conducted by the sub-department of ARP by interviewing 150 hatchery managers using a structured questionnaire.

Through these efforts the following problems were identified
Certification and screening

- Post-larvae (PL) screening, which is conducted by ARP staff, is focused on seed which is transported between provinces, often neglecting the screening of seed to be used within the province.
- A system of certification exists although certificates are sometimes produced without appropriate testing of the certified stock
- Although certificates for seed are produced by provincial authorities, these are generally not trusted by neither other provincial authorities nor farmers
- Certificates are often not available upon purchase of seed
- Most provinces do not have the necessary capacity to perform accurate screening of seed for dangerous pathogens

Hatcheries

- There are insufficient supplies of cheap, large, disease free and high quality certified broodstock
- Broodstock are often fed with live hermit crabs, which can potentially act as pathogen carriers
- A so-called "White Body Disease" appears to cause huge losses
- PL are characterized by high prevalence of Monodon BaculoVirus (MBV)
- PL can be infected with White Spot Syndrome Virus (WSSV)
- Problems with luminescent Vibrios occur frequently during larval rearing stages
- Problems with larval mortality due to the so-called Zoea-2 syndrome seem to be significant
- Antibiotics are often overused (>50 different kinds of antibiotics are applied) and/or used inappropriately during hatchery operations, leading to ineffectiveness and poor quality PL
- Banned antibiotics are also occasionally used in hatcheries.
- Clean live algal cultures for feeding early-stage larvae are generally not available
- Water quality of inlet water and during the culture cycle is often poor
- Water supplies are often polluted because of competing interests

- Disease diagnosis facilities are often poor
- Trained staff to monitor the health status and recommend prevention/treatment strategies for their disease problems is often lacking
- In general, technical knowledge in prevention and control of diseases introduced with the seed is poor at most levels

Seed and broodstock traders:
- Biosecurity is poorly implemented
- Testing for dangerous pathogens is most often not carried out or requested by traders
- In the rare cases when testing of broodstock is conducted, animals testing positive for dangerous pathogens are most often not discarded because of their extremely high value (up to 300 US$ per shrimp)
- Records on management practices or health status of a traded stock/animal are poorly kept or, most often, not kept at all.

Farmers:
- Poor awareness of what are the pathogens in the seed that can affect the crop performance
- Lack of awareness of the required certificates and of their meaning
- Poor ability to select suitable seed, using even simple tests

More information on the above issues can be found in the report from the hatchery specialist in the attached CD.

Better Management Practices for shrimp hatcheries

Development

Better Management Practices[2] (BMP) were developed using the observations made during the hatchery visits and the information gathered from hatchery staff. Experience gathered from other hatchery systems both within and outside the region and available reference material such as the FAO manual "Health management and biosecurity maintenance in white shrimp (*Penaeus vannamei*) hatcheries in Latin America" were also used, taking into account species-specific differences.

Hatchery BMPs included advice on:
- General hatchery guidelines
- Sedimentation/sand filtration
- Inlet water disinfection
- Facility preparation
- Use of epoxy paint as a tank sealant to facilitate disinfection
- Separation and disinfection of equipment for each tank, hands and feet
- Collection, preparation, transportation and acclimation of broodstock
- Individual broodstock holding
- Broodstock screening
- Broodstock nutrition
- Individual broodstock spawning/hatching techniques
- Egg/Nauplius disinfection and washing
- Larval rearing tank stocking and water exchange
- General larval health assessment

- Larval feeding regime
- Use of live algae
- *Artemia* cyst decapsulation
- *Artemia* hatching procedure
- *Artemia* nauplius disinfection
- Use of probiotics to replace antibiotics
- PL quality testing
- PL harvest and transportation
- Documentation and record keeping

Dissemination

BMP for hatcheries were disseminated on several occasions. A training course was organized for hatchery managers of both NgheAn and Ha Tinh provinces. A practical demonstration for hatchery managers of Nghe An province was also organized. In addition, a 2 weeks training course for participants from provincial Fisheries Extension Centres and ARP sub-department from Khanh Hoa and Ca Mau provinces and for trainers of hatchery managers from Nha Trang Fisheries University was held in Khanh Hoa.

Dissemination was also conducted during the frequent visits to hatcheries in the pilot provinces.

During the training courses, documents reporting the BMPs and their objective were also distributed. A BMP booklet was also developed in collaboration with NAFIQAVED, RIAs, Nha Trang Fisheries University and DOFI and is currently being disseminated throughout Viet Nam.

Implementation

BMP were implemented in 6 hatcheries, 3 in each Khanh Hoa and Ca Mau province. Implementation was supported in collaboration with SUMA Output 1.

Implementation led to the effective replacement of antibiotics with probiotics and to the production of better quality seed. In spite of the difficulties experiences by some hatcheries during the early stages of BMP implementation, with survival in BMP tanks being allegedly slightly lower than in non-BMP tanks, data collected from a BMP hatchery in Ca Mau are very promising. In fact, through the implementation of BMP in 9 tanks, the hatchery produced 60,000 PL13-15/m3 with an overall survival from nauplii to PL of over 40%. About 90% of the BMP tanks were successful in producing PL, as opposed to the 50-60% experienced by non-BMP hatcheries. BMP seed was also sold with a price 5-10 VND/PL higher than normal, which corresponds to an increment of about 30-40% over the price paid for non-BMP seed. This increased price is a response to the better performance of BMP seed in ponds, which could be observed in several instances throughout the projects implementation (see the Quynh Loc example in the box on page 25).

Better Management Practices and organic standards

In recognition of other ongoing efforts toward the production of good quality seed, the project team initiated collaboration with the Swiss Import Promotion Programme (SIPPO), an organization that is promoting the adoption of organic standards by Vietnamese shrimp farmers. The NACA/SUMA project and SIPPO joined forces and the BMP hatcheries will provide seed to be stocked in organic shrimp

farms in Ca Mau province. In addition, the BMP for hatcheries developed under the project were also incorporated with some minor modifications into the draft standards for the production of organic shrimp seed which are now being developed by Naturland.

Identifying low- risk feeds for broodstock

In view of the potential risk of pathogen transmission associated with feeding live hermit crabs to broodstock, the project also supported activities to develop polychaete farming. A polychaete expert was employed to provide technical expertise on the biology and nutritional value of different polychaete species to be cultured in Khanh Hoa province, which is the largest producer of shrimp seed.

The findings of the expert were presented at a workshop during which stakeholders from DOFI Khanh Hoa, Nha Trang Fisheries University, Institute of Oceanography and hatchery representatives discussed the way forward. It was decided that the Fisheries University took the lead of the efforts towards the culturing and reproduction of polychaetes.

The Fisheries University selected *Nereis* sp as a potential culture species. Experimental trials showed that it is possible to successfully feed polychaetes with either fish meal or shrimp pellet feed. Currently, trials are ongoing to assess the optimal feeding rate for cultured polychaetes. Signs of reproduction under culture conditions seem also to be occurring. This would represent a major step forward towards the replacement of crustaceans as broodstock feed.

Investigating the impact and determinants of White Body Disease

Because of the importance of White Body Disease (WBD) declared by hatchery managers across the whole country, in March 2005 the project organized a meeting aimed at gathering as much expertise as possible on this disease and at developing a plan of action. The meeting was attended by representatives from all the 3 RIAs, Nha Trang Fisheries University, ARP Khanh Hoa and hatchery managers. Through the meeting, some aspects of the disease behaviour and the fact that what is commonly referred to as WBD may in fact be 2 distinct diseases was highlighted. The potential role of microsporidian (fungal) parasites and/or Baculoviral Midgut-gland Necrosis Virus (BMNV) was also identified.

At the meeting it was decided that an epidemiological study of WBD should also be conducted by the Fisheries University and with the support of the project. The aim of the study would have been to quantify the impact of the disease and identify potential determinants. Questionnaires were designed and an MSc student was identified. The study is now ongoing in Ninh Thuan province. Preliminary results show that ¼ hatcheries had experienced WBD in the previous year.

Through the training course on aquatic animal epidemiology delivered to students of the Master in Aquaculture in RIA1 (see also 3.5), the project team also supported one of the students to design an epidemiological study of WBD which will be conducted in Da Nang City and Quang Nam province.

Better Management Practices for seed and broodstock traders

BMP for seed and broodstock traders were also developed. These focused on improving biosecurity during operations, reducing the stress of the shrimp during transportation, assessing shrimp health, disease testing and keeping records of practices and observations made during the time the shrimp were handled by the trader.

Two leaflets on BMP, one for each seed and broodstock traders, were also developed and are now being distributed in the main broodstock and hatchery production provinces.

Better Management Practices for shrimp farmers

The risk of diseases experienced through the stocking of PL was also reduced by creating farmers awareness on the importance of PL quality.

BMP for farmers were developed to allow the selection of good quality seed. BMP focused on assessing seed health through:

- Examining batch appearance and behaviour
- Conducting stress tests (i.e. salinity or formalin)
- Testing for dangerous pathogens such as WSSV and MBV
- Assessing damages to appendages and other clinical signs on the PL if a microscope is available in the hatchery

Training on BMP to assess PL quality was also delivered to pilot farming communities (see 3.2 for more details on pilots). During the training courses simple equipment such as magnifying lenses was also given to farmers to allow a more effective assessment of seed quality.

A leaflet to assist farmers in PL quality assessment was also produced. This information was also incorporated into a BMP booklet which was distributed to farmers groups and extension workers in all the 5 SUMA pilot provinces and in Ninh Thuan.

To support BMP implementation, over the duration of the project, free WSSV testing was also offered to the pilot farmers. Farmers however were requested to organize themselves to allow the delivery of a seed sample to the Polymerase Chain Reaction (PCR) laboratory. Testing was conducted through the collaboration between the project team and DOFI and was built into the training program for provincial staff.

BMP implementation was followed up with pilot farmer groups through regular visits and experiences were reviewed upon crop completion with the aim of providing more suitable support.

The Importance of Testing Seed for WSSV
BMP to reduce the disease risk associated with stocking seed were disseminated to the farmers of Quynh Loc commune (Nghe An province) during 2 consecutive year, starting in 2004. In the first year, although farmers conducted some assessment of seed health, no batch was submitted by farmers to allow testing for the dangerous shrimp pathogen WSSV. On that year, the commune was seriously affected by White Spot Disease and only 10% of the farmers profited from shrimp aquaculture. In 2005, about 2/3 of the farmers stocked seed that tested negative for WSSV. White Spot Disease did occur in the commune but it affected only ponds that stocked seed which had not been tested for the virus and 3/4 of the farmers managed to make a profit!

Institutional strengthening

Awareness on BMP to reduce the risk of diseases through the seed was built at all institutional levels (from commune to province) through training courses on BMP implementation and regular meetings.

Training of district and provincial staff on methods to assess general PL health and the presence of MBV and WSSV was also conducted in QN, NA, HT and CM. When not already available, equipment for conducting the above tests was also provided. More information on capacity building activities at the provincial level can be found in 3.3 and 3.4. A complete list of training courses and of equipment supplied by the project can be found in Annexes C and D respectively.

Legal documents

At the national level, the project supported the development of regulation on testing and certification of aquatic animals including seed and broodstock (see also 3.4). The regulation was recently discussed and finalized at the meeting of the Technical Unit on Disease and Environment of the National Advisory Committee on Aquatic Animal Health (NACAAH).

The development of provincial level regulations was also supported in Nghe An and Ca Mau provinces (see also 3.3). Regulations were targeted mainly at implementing risk reduction practices and limiting environmental pollution.

3.2 Reducing risk of diseases in farms

The target was to develop, disseminate and implement strategies to reduce the risk of aquatic animal disease outbreaks in farms.

The current situation

The current situation was assessed by working with shrimp farming communities and local authorities mainly in the provinces of Quang Ninh, Nghe An, Ha Tinh and Ca Mau. Although some differences could be detected between the farming systems in the pilot provinces, major problems consisted in:

- Poor collaboration between farmers. This often prevented effective water management, disease control and costs sharing

(e.g. for seed testing etc.).

- Poor pond preparation, which often included not removing organic matter from the pond bottom, unsuitable handling of acid soils and lack of blooming of the pond water before stocking
- Poor stocking practices, witnessed by the widespread use of shallow, overcrowded nurseries.
- Improper water and feed management emphasized by the fact that the pond water was often very clear and with water quality parameters (e.g. pH and alkalinity) outside suitable levels.
- Inadequate health management, indicated by the fact that often farmers improperly used water exchange in an attempt to solve White Spot Disease outbreaks or did not know how to handle incidences of Vibriosis.

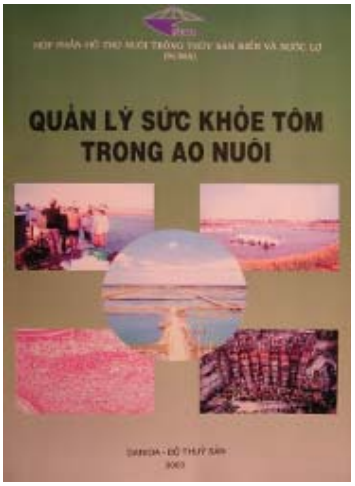
More details on the issues highlighted above and on the approach used by the project to address them can be found in the attached CD.

Better Management Practices for shrimp farming

Development

To respond to the shortcomings of shrimp farmers, the project developed simple and practical BMPs to address the needs of less resourced small-scale farmers.

Practices were developed using regional expertise and manuals among which the following were considered particularly relevant to the Vietnamese shrimp farming system:



- "Health management in shrimp ponds" by Dr Pornlerd Chanratchakool.
  This book is now in its 3rd edition and it has been published in several languages including Vietnamese. It summarizes the experience of several farming systems worldwide.

- "Shrimp health management extension manual" produced by the Marine Product Export Development Authority of India (MPEDA) and NACA. This manual has a strong focus on semi-intensive farming system and, although it draws mainly on experiences gathered from India, most advised practices are very relevant also to the Vietnamese system.

BMP were developed with the aim of providing farmers with a tool to comply with the Principles for Responsible Shrimp Farming developed by the World Bank (WB), NACA, the World Wildlife Fund (WWF), FAO and the United Nations Environment Programme (UNEP) through a series of stakeholder consultations.

BMP were focused on the following main areas:

- Site selection and farm construction
- Pond preparation
- Stocking practices
- Pond management
- Health management
- Harvesting

The development of farmer groups and the establishment of a voluntary extension system within the farming community were also

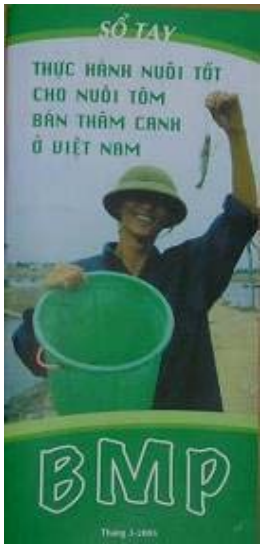
encouraged. This approach proved very successful in India, where a system of so called aquaclubs was established and is rapidly spreading across the country and to other countries in the region.

Dissemination

BMP were initially disseminated to pilot farming communities. In 2004 a total of 6 pilot communes in Nghe An and Ha Tinh were selected with the support of provincial DOFIs. These were: Quynh Loc and Quynh Bang (Quynh Luu District, NA), Dien Van (Dien Chau District, NA), Xuan Dan (Nghi Xuan District, HT), Ho Do (Thach Ha District, HT) and Ky Hai (Ky Anh District, HT). Activities involved 269 ponds (341 households). In 2005, the project activities were extended to a large commune in Quang Ninh province (Hai Lang, Tien Yen District) involving an additional 314 ponds and households and leading to a total of 655 households directly benefiting from BMP dissemination over the 2-year project lifespan.

Dissemination in pilot communes was conducted through training courses for farmers and volunteer extension workers. Both regular and *ad hoc* meetings were also organized to support dissemination. Training on BMP was also delivered to extension workers at provincial, district and commune level with the double objective of building capacity (see 3.3) and standardizing extension messages.

Leaflets summarizing BMP were also developed. These provided advice on pond preparation, stocking practices, pond management and health management. The leaflets were later incorporated into a more comprehensive BMP booklet. Extension material was then distributed to extension workers and farming communities in Quang Ninh, Nghe An, Ha Tinh, Ninh Thuan and Ca Mau provinces.



The project also supported NAFIQAVED to develop 2 sets of extension material on GAP to target both improved extensive and intensive farmers. This material includes also the BMP messages developed through the NACA/SUMA projects and forms the basis for dissemination of GAP/BMP across the whole country.

In Ca Mau province, BMP were also disseminated through Training of Trainers activities in collaboration with Aquaculture Farmer Field School (AFFS) courses. BMP were also incorporated into the AFFS manual for improved extensive shrimp farming systems of Ca Mau province.

A training course for master trainers of AFFS for intensive shrimp farming was also conducted in Ca Mau province. This activity was carried out to respond to the request of provincial DOFI, which recognized a trend towards intensification in some farming communities and wanted to offer advice to farmers to improve the sustainability of their farming operations.

Key extension messages were also included into the pond books that were distributed to pilot farmers (see folder) and more widely as part of the development of the surveillance system (see 3.4).

To ease the flow of extension messages both to and within farming communities, the project also supported SUMA in the promotion of OASIS (One Stop Aqua Supply and Information Shop). This private-owned mechanism encourages farmers to gather in information-

dense locations and has proven very successful in other countries in the region to deliver extension messages *to* and collect information *from* farming communities. Pilots were established by SUMA in QN, NA and HT provinces. More details on this activity can be found in the SUMA Component Completion Report in the attached CD.

Implementation

During the 2004 crop, BMP implementation was supervised by the project team through fortnightly visits. It could be observed that BMP were generally well accepted and applied by pilot farmers.

Farmers appeared to see the advantage of working in groups and a system of volunteer extension workers was established in every pilot commune. This system helped significantly the implementation of BMP, especially during stocking and water management. During the second crop (in 2005), volunteer extension workers also became the target of training delivered by the project and the vehicle of delivering extension messages to other farmers.

Overall farmers accepted solutions to health problems that did not include the use of antibiotics or other chemicals. Owing to the occurrence of White Spot Disease (WSD) outbreaks, farmers also realized the importance of testing shrimp seed for WSSV which is increasingly being implemented with the support also of provincial authorities.

The need for keeping records on pond management and shrimp health condition was also recognized by farmers. Record keeping was aided by supplying farmers with pond books, which are books used to collect information on management practices and observations made in the pond. Pond books were developed by the project in 2004 and modified in 2005 following pilot testing with farming communities.

At the end of the first crop a questionnaire was also delivered to farmers to collect more detailed information on the practices they adopted throughout the production cycle. From the questionnaire, 3 indicators of BMP implementation were selected. These were:

- Removing waste soil from the pond bed before stocking: an indicator of correct pond preparation
- Not ploughing if the pond had acid soil: a practice indicating the correct handling of acid soil
- Testing of seed for WSSV: a practice for reducing the risk of WSD outbreaks

Data analyses showed that not applying BMP significantly increased the risk of experiencing shrimp mortality during the production cycle, as indicated by the Relative Risk (RR), which measures how many times more likely to experience mortality is a pond where a certain BMP was not followed.

BMP <u>not</u> followed	**RR of finding dead**	**p-value**
Removing soil	1.36	0.001
Acid no ploughing	1.36	0.022
Test seed for WSSV	1.74	< 0.001

Farmers following BMP also harvested significantly much higher yields per hectare.

BMP followed	Kg/ha BMP	Kg/ha non-BMP	p-value
Removing soil	385	123	< 0.001
Acid no ploughing	73	42	0.023
Test PL for WSSV	452	112	< 0.001

BMP application also increased the probability of making a profit. This beneficial effect was most clear when looking at stocking WSSV tested seed. In fact, only 30% of the farmers that made a loss had tested the seed, while almost 60% of the farmers that made a profit had done that, showing a 2-fold increase in the likelihood of making a profit when seed was tested.

BMP followed	Loss	Even	Profit	p-value
Removing soil	45%	65%	70%	0.001
Acid no plough	16%	50%	47%	0.006
Test PL for WSSV	***30%***	29.4%	***59%***	< 0.001

Results of implementation were presented to farmers at meetings held at the end of the crop. At those meetings feedback was also received from farmers, to allow the refinement of BMP to fit farmers' needs, while supporting the sustainable development of the shrimp farming sector.

Implementing BMP in small-scale shrimp farms: a Small Example of Big Success

Xuan Dan commune, Ha Tinh province, is one of the poorest beneficiaries of the project. Its extremely acid soil and poor technical knowledge and resources of the farmers led to frequent crop losses over the years.

At the time of the start of the project, most farmers had already stocked their ponds and the shortcomings of the poor farming practices adopted could be seen very clearly. Of the 25 farmers in the commune, only 1 decided to drain the pond and to re-start the crop following the project BMPs. In that crop, only 1/3 of the Xuan Dan farmers made a profit, among which the absolute winner was the BMP farmer, who had a production almost 10 times higher than any other farmer in the commune!

Self-regulation in pilot farming communities

Through its continuous efforts to promote BMP implementation, the project also supported the shrimp farmers of Quynh Bang commune to develop a document aimed at self-regulating farming activities. The document incorporates essential BMP concepts and is expected to be approved for adoption by the farming community before the end of

the lunar year.

Better Management Practices for marine fish

The project supported also activities aimed at developing BMP for marine fish culture in cages. These efforts were led by RIA1, but benefited also from the input from the Dept of Science and Technology, NAFIQAVED and regional experts such as Dr Ketut Sugama from Indonesia. The BMP were designed to implement the "International Standard for the Trade of Live Reef Food Fish".

BMP were developed on:

- Site Selection, Cage Design and Materials, Equipment, etc
- Farming Practices
- Fingerlings Resources, Selection Criteria and Handling
- Nursery Period
- Feed and Feeding Management
- Farm Level Fish Health Management
- Chemicals and Drugs Usage
- Transportation
- Environment, Biodiversity, and Legislations
- Economic Analysis
- Social Aspects of BMP
- Training and Extension

BMP guidelines were developed through consultation with marine fish farmers and government authorities in marine aquaculture areas in the northern, central and southern region of Vietnam. The BMP guidelines are now being finalized and will be used in future to develop extension material. The draft document is provided in the attached CD.

Through the project, 2 extension booklets produced as part of a NACA/ACIAR project and aimed at implementing more responsible mariculture were also translated into Vietnamese. These documents were:

- A Guide to Small-Scale Marine Finfish Hatchery Technology
- A Practical Guide to Feed and Feed Management for Cultured Groupers

Booklets on small scale hatchery technology have also been printed and will be disseminated to hatcheries interested in marine fish seed production through the provincial Fisheries Extension Centres within the next few weeks.

Identify market opportunities for BMP/GAP products

In order to support the implementation of BMP by farmers, the project team also attempted to identify market opportunities for BMP products. Several steps have been taken in this direction:

- Through a close collaboration with NAFIQAVED, a certification system for BMP/GAP products is under development. This system will be based on the WB/NACA/WWF/FAO/UNEP principles for responsible shrimp farming, therefore increasing its international credibility and the chances of BMP products facing better prices.
- European retailers have also been contacted in an attempt to increase the market opportunities for better quality products and potentially obtain a better price. A project to support Vietnamese farming communities to produce better products to be marketed

on the Italian market is also being developed and will be submitted for consideration to the Italian government within the next few months.

- Links are also been made with other certification schemes such as the Aquaculture Certification Council/Global Aquaculture Alliance, Safe Quality Food and others in an attempt to harmonize these efforts for the benefits of both producers and consumers

Continuous learning

Better Management Practices are not static. They have to allow the sustainable development of the aquaculture sector while responding to continuously changing farmers' needs and market requirements. For this reason, the project contributed also to initiatives aimed at identifying the impact of health problems faced by farmers and potential solution, with an aim at incorporating new findings into revised sets of BMP. To this scope an epidemiological approach was often used. More information on these activities can be found under 3.5.

3.3 Developing capacity at provincial-level

This output was aimed at improving the capacity of provincial, district and local institutions to manage the risk of disease outbreaks. As such, it required a high degree of harmonization and stakeholder consultation. This was achieved through continuous interactions at all levels.

Targeting harmonization

Regular meetings were conducted with the DOFIs, ARP, FEC and, if present within the province, RIA stations and university staff. Representatives from province and districts often also attended farmers meetings to allow a more effective harmonization but also to make sure that farmers' needs were properly addressed.

Developing human resources and infrastructures

Because of the widely recognized need to prioritize resources and to provide more effective services to the farmers, the project focused a great deal of attention towards the building of capacity for making level-1 (naked eye) diagnosis of health problems.

Farmers and extension workers at all levels were trained on several occasions on diagnosing health problems from the pond side and on suitable responses to the recognized problems. Volunteer extension workers (43) and extension workers (30) were also provided with pH and alkalinity kits, thermometers and salinity meters to allow the quick assessment of water quality (see Annex D for further details on the equipment delivered through the project).

At district level, training was also provided on quick and cost-effective methods for assessing MBV presence and general health in seed and for WSD diagnosis. At this scope, microscopes were also provided. This allowed the establishment of a service for farmers that, before the start of the project, was present only at the provincial level or in the few ARP stations.

Capacity on the use of PCR for the detection of WSSV was also developed. The project supported training on PCR for 3 provinces (QN, NA, HT) and discussion on how to improve PCR diagnostic capabilities was also conducted in KH and CM. Training was delivered throughout the project duration and consisted of theory and hands-on activities both in a well established laboratory and in the participants' laboratory.

One PCR laboratory was also established in Ha Tinh province. Two additional PCR laboratories are also being established in Khanh Hoa and Ca Mau provinces through the joint financial support of DOFI and SUMA. These PCR laboratories were scheduled for establishment much earlier during the project implementation, but their set up had to be delayed owing to uncertain availability of financial resources. Three other laboratories (2 in QN and 1 in NA) were supported with additional equipment to allow them to operate more effectively and accurately (e.g. reducing the risk of contamination).

Khanh Hoa and Ca Mau staff that will be operating laboratories yet to be established will benefit from the expertise of technical personnel already working in PCR laboratories within the province. To ease this process the project team has already established the necessary contacts. In addition, although beyond the expiration date of the project, project staff has already committed resources to supervise the setting-up of the two laboratories and conduct short-term training activities upon delivery of the equipment.

Capacity building for environmental impact assessment

Support was also provided to raise awareness and build capacity in EIA through two training courses on the EIA guidelines. The courses were attended by MOFI, RIA and provincial DOFIs and DONREs. The materials developed for and during the two training courses have been widely disseminated to provincial DOFIs, DONREs and MOFI. Workshops held during FSPS 1 on environmental management and development of the EIA guidelines have also helped raise awareness and develop strategies for improved environmental management of aquaculture in Vietnam.

Supporting the development of a legal framework

To assist the implementation of strategies aimed at reducing the risk of aquatic animal disease outbreaks while increasing the environmental sustainability of farming operations, the project also supported provincial DOFIs during the development of legal documents. As an outcome, 3 legal documents were submitted and approved by the Provincial People's Committee, 2 in Nghe An and 1 in Ca Mau provinces. These were:

- Decision on seed quality management in Nghe An province
- Indication on quality assurance in broodstock and postlarvae in Nghe An province
- Regulation on environmental protection in seed production in Ca Mau province

3.4 Developing an effective surveillance system

The aim of this output was to develop and implement effective provincial surveillance systems to monitor and respond effectively to aquatic animal disease outbreaks. Provincial systems were also to be linked to a national surveillance system.

Understanding the needs

Although information on the area affected by diseases is collected regularly, it is widely recognized that the collection of this information is not sufficiently speedy and does not reach the necessary stakeholders in a timely way. In addition, concerns about the accuracy of this information have often been raised. These constraints prevent the implementation of a rapid, synergic and appropriate response to health problems. Similarly, these issues make developing accurate need-base aquaculture plans difficult.

There is therefore the need for a mechanism capable of collecting accurate information from the production system and deliver it swiftly to the relevant stakeholders, which in turn should then be capable of implementing a harmonized, effective and accurate response, which should include making an accurate diagnosis and advise farmers on how to deal with a certain problem.

Designing the system

To fit the above needs, a system was designed during a series of stakeholder consultations which involved DOFIs, ARP, RIAs (both headquarters and stations), NAFIQAVED, Dept of Science and Technology, Department of Agriculture and Rural Development (DARD), Dept. of Animal Health of the Ministry of Agriculture and Rural Development (MARD), farming communities, with the support of the SUMA, SUFA and STOFA components of the FSPS programme.

The system was developed to collect both normal and abnormal observations from shrimp ponds. Pilots were conducted in all the 5 pilot provinces, although with some variations between them.

- *Nghe An*. All the shrimp farming communes were involved. The system was implemented by commune extension workers, which in some occasions were farmers' representatives.
- *Ha Tinh*. Five communes across the whole 4 shrimp farming district. The system was implemented by commune extension workers, which in some occasions were farmers' representatives.
- *Quang Ninh*. One large shrimp farming commune involved. The system was implemented by a volunteer extension worker.
- *Khanh Hoa*. Two communes involved. The system was implemented by staff of the extension centre.
- *Ca Mau*. The system involved 5 communes in 5 different districts and was implemented by commune extension workers.

In each pilot commune, 20 ponds were selected to be as representative as possible of the commune. Pilot farmers were trained by extension workers on how to collect information on practices and observations onto a pond book, which had been previously pilot tested among farming communities in different

provinces to ease the farmers' role and maximize compliance.

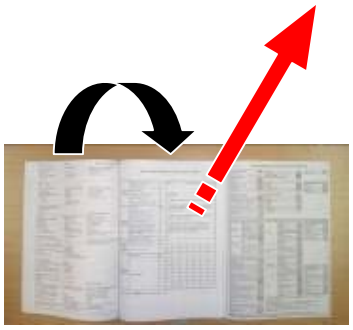
Commune extension workers were to collect information on normal and abnormal observations from those 20 ponds. However, if a previously unobserved health problem was to occur outside the 20 selected ponds, data collection was also to be extended to those ponds. To be able to collect the required information, commune extension workers were trained on several occasions on how to perform diagnoses of health problems by looking only at clinical signs (Level-1). Although conducting level-1 diagnosis can be extremely difficult, this approach was preferred to fit the Vietnamese context, which is often characterised by limited resources. The training program also included elements on how to select a representative sample of ponds and how to fill in pond books, so that commune extension workers could effectively transfer this knowledge to farmers. Training was delivered by project and RIAs staff.

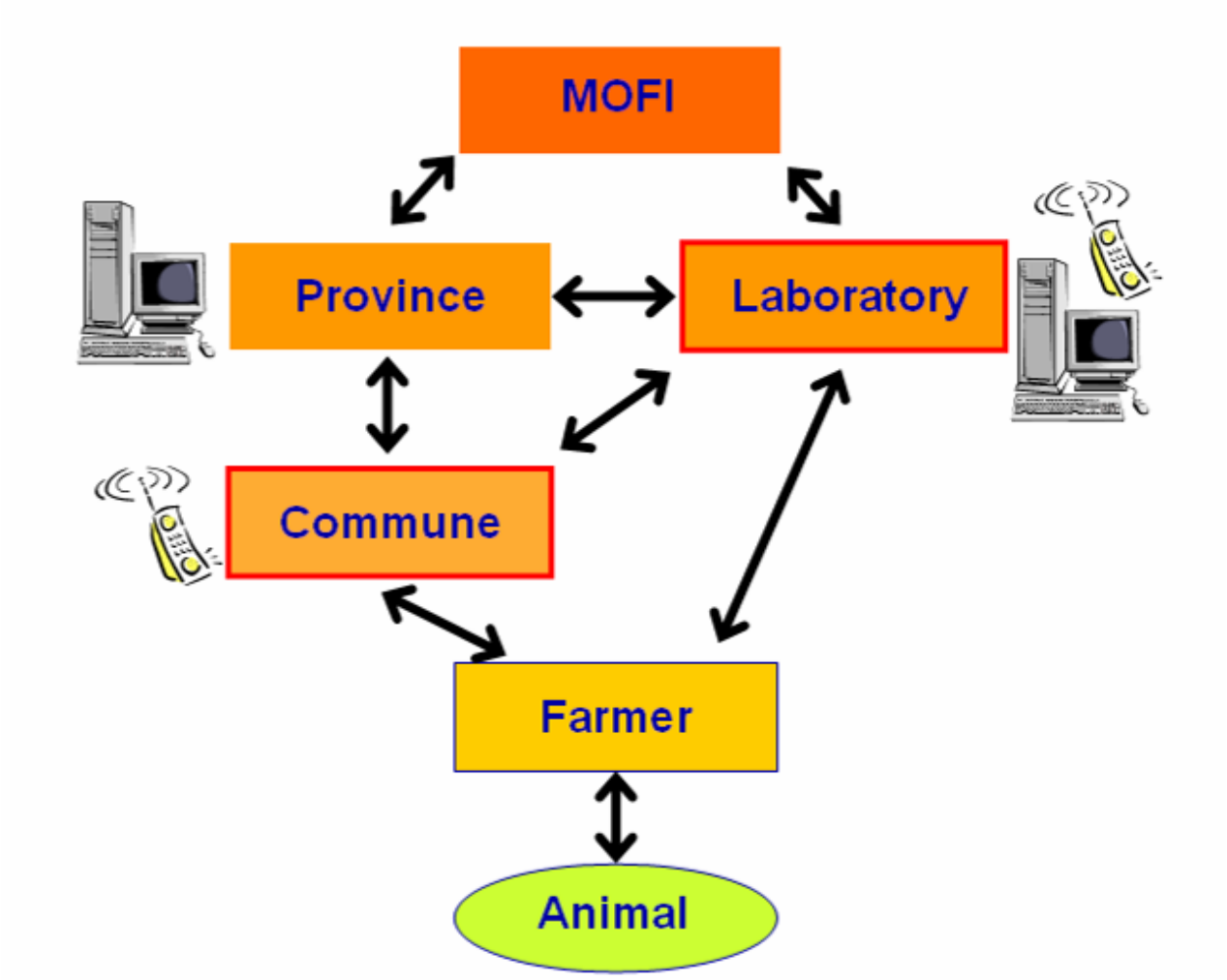
Information collected by commune extension workers was to be recorded onto a recording sheet. Using coding instructions, the information was then to be transferred into a coding sheet and then digitalized and sent to a centralized database using a mobile phone. Information was sent in the form of a coded SMS, which could be recorded directly on the database, without any further human intervention. This mechanism was developed with the assistance of the STOFA component and was chosen because would have allowed the digitalization at a level very close to the production system and would have had the advantage of being timelier and capable of collecting information from an overall higher number of ponds because of the popular use of mobile phones. To ease data collection, coding books containing recording sheets, coding sheets and coding instructions were developed by the project and distributed to the relevant people.

Once sent, information was then to be made accessible to provincial ARP or fisheries extension centre for approval. Districts would have had access to the information on a regular basis or upon request.

Upon the occurrence of an unknown health problem or when diagnosis was uncertain, commune extension workers were to collect samples and deliver them to the district laboratory and/or to the provincial laboratory for a higher level diagnosis. The information from the laboratories was to be transferred to the database (and made accessible to provincial and national level stakeholders) using a computer or, if necessary a mobile phone.

Although all the information was fed into the centralized database, the flow of information or samples is more easily represented with the diagram below.





Depending on the kind of problem being reported, a harmonized action was to be taken by the stakeholders.

Protocols on how to deal with different health problems were developed by the project team and disseminated to extension workers and farming communities. For health problems in shrimp farms a distinction was made between:
- Serious viral diseases (e.g. WSD, YHD) for which no treatment is available and emergency harvest without releasing the water is the only option
- Bacteria or parasitic diseases, the impact of which can be alleviated through the adoption of simple management practices
- Extreme environmental conditions, which can be solved by bringing the environmental parameter causing the health problem within acceptable values.

A document providing more information on surveillance and on the pilot system and containing the forms and instructions used for the implementation of the system can be found in the attached CD.

Results from piloting the system

The pilot surveillance system was implemented in all the 5 provinces. Implementation was monitored by the project team by conducting monthly meetings with commune extension workers and stakeholders at district and provincial level.

All the 5 provinces in which the system was piloted recognized the usefulness of having a surveillance system. Both normal and abnormal information was successfully reported onto the recording sheets and on the coding sheets. The quality of the information appeared generally good.

A final evaluation of the surveillance system indicated that, although further training in disease diagnosis was often requested, only 3% of the commune extension workers in charge of collecting and sending the information had difficulties in transferring the pond-side observations into the provided recording sheet. On the contrary 47% of them expressed difficulties in sending the information collected using the provided mobiles. All the commune extension workers in all the 5 pilot provinces declared that the IT system put in place did not give adequate feedback (i.e. no feedback was received, feedback was late or the wrong feedback was given) and in some cases a delay in receiving feedback of up to 1 week was reported. Similarly, all the 5 pilot provinces lamented delays in the establishment of a website to access information from the system and difficulties in assessing that information. In addition, 3/5 provinces faced problems related to an allegedly poor network system, with one province having to use a telephone connection to be able to access the information through the internet. The above technical issues often hampered the prompt response to emergencies.

To overcome these difficulties the project team communicated the issues raised by the stakeholders to the STOFA component and is currently exploring alternative approaches to transfer the information collected from the farms to a centralized database.

Although laboratories are not yet fully linked to the database, this step will be undertaken in the near future through a project already approved by MOFI and developed with the support of the project team.

3.5 Developing capacity at national-level

Because of the deep commitment by national level stakeholders to control disease outbreaks and improve the sustainability of the aquaculture sector, it was recognized that the project could achieve its objective more effectively by increasing the capacity building efforts at the national level. For this reason an additional output was added to the project workplan.

Activities under this output were aimed at supporting Viet Nam in the implementation of the Asia regional Technical Guidelines (TG) on aquatic animal health management, to which Viet Nam agreed in the year 2000 with the Beijing consensus. Capacity building on how to achieve sustainable aquaculture development using a broader approach than looking only at animal health was also targeted.

Developing a national aquatic animal health strategy

Possessing a national strategy is essential to support the harmonization of aquatic animal health management within a country. In Viet Nam, a major step in this direction was the establishment of a National Advisory Committee for Aquatic Animal Health (NACAAH).

The committee was established with a strong regional and international support. Six people key to aquatic animal management in Viet Nam were invited to a FAO/NACA/World Fish Center/Government of Indonesia regional workshop on preparedness and response to aquatic animal health emergencies.in Jakarta Indonesia (see more details below). These were key staff from the Dept. of Science and Technology, NAFIQAVED, Dept. of Aquaculture, RIA1 and RIA2. Following the workshop, an additional 2-days meeting was organized to which, in addition to the 6 Vietnamese participants, a range of international experts was also invited. In addition to FAO and NACA experts, invited participants included representatives of the 4 countries in the Asia-Pacific region which already had a similar committee (i.e. Australia, Thailand, Indonesia and Malaysia). The objective of the meeting was to exchange experiences and draft the structure and responsibilities of the committee. Following a range of presentations by both Vietnamese and international participants, a draft structure and Terms or Reference for the committee were developed. These were submitted for further consultation within MOFI and the NACAAH was officially established in April 2005.

Several meetings of the committee and its Technical Units have already been held. Latest meetings were supported financially entirely by MOFI, demonstrating the sustainability of the committee and its activities. Experiences from the committee establishment and operation have been disseminated on several occasions (see also 3.6) and the progress made by Viet Nam in this direction is now widely recognized in the Asia-Pacific region.

Building capacity in aquatic animal health

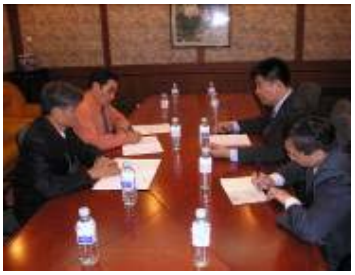
Sharing experiences within the Asia-Pacific region

Over the project duration, key figures in Vietnamese aquaculture were invited to a range of conferences and meetings with the objective of learning from experiences gathered in other countries on aquatic animal health, but also to share experiences gathered in Viet Nam (see details in Appendix E).

As mentioned above, in September 2004, 6 key figures on aquatic animal health in Viet Nam attended a major workshop aimed at sharing experiences on the development of plans for the early detection and response to emergencies. The workshop was held in Jakarta, Indonesia and hosted representatives from 10 countries in the region, in addition to representatives from international organizations such as FAO, NACA and the Southeast Asian Fisheries Development Center (SEAFDEC).

In November 2004 in Beijing, China, following a workshop aimed at sharing experiences on BMP implementation (see more details below), a meeting between the Head of NAFIQAVED and the Deputy General Director of the Bureau of Fisheries of the Ministry of

Agriculture of China was also held. To ease communication, the attendance of a Vietnamese- Chinese interpreter was also supported through FAO. Through this meeting, discussions for the bilateral cooperation between Viet Nam and China for the management of aquatic animal health and especially for the implementation of responsible movement of live animal across the Viet Nam/China border was initiated and it is continuing.



In May 2005, the attendance of 1 MOFI staff to the Annual conference of the World Aquaculture Society (Bali, Indonesia) was supported. During the conference, which had over 3,000 participants and hosted over 750 oral and over 200 poster presentations, several papers were presented on aquatic animal health issues such as the development of national strategies, surveillance and reporting systems, contingency planning and many others.

In June 2005, the terminal workshop of a FAO Technical Cooperation Programme (TCP) project on health management in shrimp aquaculture in Andhra Pradesh was held in Hyderabad, India. Two MOFI staff attended the workshop and could benefit from the discussion which included the development of a state-wide strategy for aquatic animal disease management.

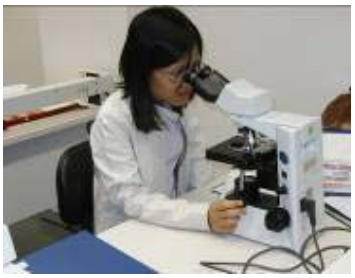
In support to the establishment of a network of shrimp health experts, in October 2005 6 shrimp health officers from NAFIQAVED, RIA1, RIA2 and RIA3 were supported to attend a 6-day training course on shrimp health management held in NACA headquarters. The training course was delivered by shrimp health experts such as Prof Chalore Limsuwan, Prof Timothy Flegel, Dr Pornlerd Chanratchakool and Dr Dan Fegan.

On occasion of the 6th Symposium on Diseases in Asian Aquaculture, the attendance of 2 MOFI staff was supported. This high profile triennial conference hosted 56 oral and 94 poster presentations. During the event, one of the participants delivered an oral presentation. The event also allowed the networking of the Vietnamese participants with other aquatic animal health professionals in the region.

<u>Building capacity in diagnostics and epidemiology in collaboration with Regional Resource Experts</u>

In addition to developing capacity on diagnostics at commune, district and province level, capacity building was also required at the national level and in universities. Because higher-level laboratories in Viet Nam are already capable of performing most diagnostic tests, capacity building was focused on emerging or potentially emerging diseases. To achieve this, a close collaboration with Asia-Pacific Regional Resource Experts (RRE) on aquatic animal health was pursued and obtained.

The project supported the attendance of 2 MOFI staff to a training course organized by SEAFDEC on the diagnosis of Taura Syndrome Virus and Koi Herpes Virus, two emerging diseases that are attracting a great deal of attention within the region. The training course was conducted by 2 RRE in crustacean and fish diseases. In addition, through the project 1 MOFI staff was also sponsored to attend a training course on shrimp health management and diagnostics, which was delivered by the expert responsible of the Reference Laboratory



for crustacean diseases of the World Organization for Animal Health (Office International des Epizooties, OIE).

Upon a request submitted to the project, capacity was built for RIA2 staff to allow the detection of Mourylian Virus (MoV) in *P. monodon* shrimp. This activity was conducted with the support of the RRE who developed the PCR protocol for the detection of this pathogen. The RRE shared with the project both the publication (still *in print*) reporting the protocol and some infected material to be used as positive control during testing. As a result RIA2 staff is now capable of performing MoV testing.

Capacity was also built in RIA2 for the detection of White Tail Disease in *Macrobrachium rosembergii*, which is the only disease affecting freshwater prawn which has been included in the Asia-Pacific regional list of diseases. Also in this case, the support of a RRE, who shared protocols and infected material with the project team and Vietnamese institutions, was essential. RIA2 is now capable of running tests for this disease and the protocols and infected material are now being shared also with other research institutes and universities across the country.

Through its continuous efforts to provide cost-effective low-risk alternatives to Vietnamese farming communities, in 2005 the SUMA component promoted the culture of Babylonia snails in Khanh Hoa province. While piloting Babylonia farming, however, Swollen Siphon Disease (SSD), a serious disease capable of killing completely all the snail farmed in a bay within 1 week, began striking farms in Khanh Hoa. Through the project, samples were sent to a RRE in Australia and the involvement of massive bacteria infections was recognized. An epidemiological investigation to clarify further the causes of this disease was also initiated through RIA3. Preliminary results from these efforts indicate that farmers capable of controlling the culture environment, e.g. farming snails in cages located within ponds, and improved hygienic conditions in the farm may reduce the occurrence of the disease. In addition, farming in water with lower salinity may also play a role in reducing the risk of outbreaks.

With the support of the RRE in aquatic epidemiology this investigation will continue also beyond the duration of the project, therefore ensuring the sustainability of the efforts initiated.

The importance of using epidemiological methods to address aquatic animal health problems has been widely recognized by many experts and donor organizations. Nevertheless, capacity in this area of expertise is still largely under-developed, not only in the Asian region but also worldwide. Benefiting from the involvement in the project of the RRE in aquatic epidemiology, capacity was built in several Vietnamese institutions through the continuous interactions with the RRE. In addition, over 2 consecutive years, aquatic epidemiology was also taught by the project team to the student of two NORAD-supported Master courses in Aquaculture which were held in RIA1.

The development of capacity in aquatic animal disease diagnostics was also supported by assisting NAFIQAVED to translate into Vietnamese and print the "Asian Diagnostic Guide to Aquatic Animal Diseases". This FAO manual on diagnostics is considered a key document for aquatic animal health officers in the region and

describes methods to accurately diagnose aquatic animal diseases using tools ranging from gross observation to molecular methods.

Reducing the Risk of Diseases in Freshwater Prawn Hatcheries: the Importance of Regional Interactions

Freshwater prawn aquaculture has proven very successful for alleviating poverty in Bangladesh. For this reason, SUMA and SUFA supported the establishment of a *Macrobrachium rosembergii* prawn hatchery capable of supplying prawn seed to poor farmers in Nghe An province.

Prawn seed production, however, can be a risky business, especially because of the deadly White Tail Disease, the most serious disease affecting freshwater prawn larvae and the cause of huge economic losses across the Asian region.

To cope with this threat, the project used the regional network of expertise and identified an expert from India who was capable of supporting Viet Nam to build capacity in WTD detection. Through this activity, the prawn broodstock used in the Nghe An hatchery generated 3 batches of healthy seed, which was the first prawn seed produced in the province. Most importantly, different laboratories across the country have now the tools for reducing more widely the impact of this disease.

Supporting more broadly efforts towards responsible aquaculture production

Because aquatic animal health management can only be achieved if its links with different areas of expertise are fully considered, the project supported MOFI in a number of activities targeting responsible aquaculture development.

<u>Building capacity in responsible aquaculture production and on better management practices</u>

Since 1999, NACA played a key role together with the WB, WWF, FAO and UNEP in the development of the principles for responsible shrimp farming. Over the past 2 years, two stakeholder consultations were held to discuss the principles before they are submitted to the FAO Committee on Fisheries, Sub-committee on Aquaculture next September. The first one was during the international workshop on "Healthy, safe and environmentally sound shrimp farming" organized in Beijing by FAO, NACA and Government of China. The second event was a special session organized by FAO, NACA, WAS, UNEP and Government of Indonesia on "Principles and Practices for the Environment and the Market".

MOFI staff was supported to attend both events and had a chance to learn from the efforts ongoing worldwide on the development of principles and better management practices for responsible aquaculture. In addition, these events also allowed the sharing of the experiences gathered in Viet Nam.

At the meeting of the FAO TCP project on health management in shrimp aquaculture held in Andhra Pradesh, India, issues related to the development and implementation of BMP for shrimp and the development and management of farmers groups were also discussed. These topics were very relevant to the ongoing work of the 2 MOFI staff who participated to the event.

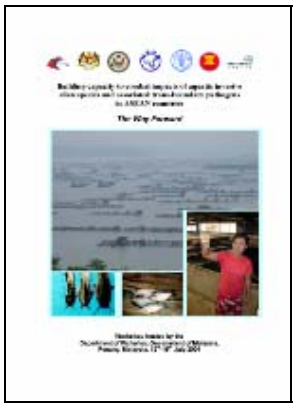
Through the above initiatives, the project contributed to MOFI's steps to produce safer and healthier aquaculture products. Thanks to the close interaction with NAFIQAVED and the Dept of Aquaculture the project could also support efforts for the development of both regulations and extension material supporting GAP/BMP implementation. Thanks to these efforts, GAP/BMP will be disseminated to farmers across the whole country, leading to a large-scale sharing of the experiences gathered through the pilot activities of NAFIQAVED and the project. The efforts of Viet Nam in this direction were recognized across the region and Indonesia has already requested the project team to share experiences in order to assist the sustainable development of the Indonesian shrimp farming sector.

Guidelines for responsible marine fish culture in Viet Nam are also being developed by RIA1, NAFIQAVED and Dept of Science and Technology with the support of the project and of Prof. Ketut Sugama, a high profile regional expert in mariculture from Indonesia.

The efforts devoted by the project to Viet Nam's development in the direction of sustainable aquaculture development are now leading to a wider impact in the region. This is witnessed by the fact that Indonesia is requesting Viet Nam to share their experiences on the development of Codes of Practice for responsible shrimp farming.

Dealing with invasive alien species

Over the past years, several stakeholders have begun raising concerns towards the introduction and proliferation of invasive alien species. To address this issue a workshop on "Building capacity to combat invasive alien species and associated trans-boundary pathogens in ASEAN countries" was organized in July 2004 by NACA and the Government of Malaysia in collaboration with FAO, ASEAN and the United States Department of State. The event was attended by several MOFI staff, 2 of which were supported by the project. Vietnamese participants also delivered a presentation on the present status and impact of invasive species in Viet Nam. At the workshop, a great deal of discussion was also devoted to the analysis of *P. vannamei* introduction in the Asian region.



To address the controversial issue of *P. vannamei* in Viet Nam, the attendance of 1 MOFI staff to the Regional consulting workshop on *P. vannamei* and exotic shrimps held in the Philippines and organized by SEAFDEC was also supported through the project.

In addition, upon request of MOFI, in April 2005 the project also organized a workshop to share opinions on *P. vannamei* farming and allow MOFI to take an informed decision towards farming of this species. The workshop hosted 14 international and 9 national presentations and allowed a very dynamic exchange of information. At the workshop, the expansion of *P. vannamei* farming in Viet Nam was discouraged by most international experts. As a result it was decided that *P. monodon* would be the main shrimp species farmed in Viet Nam, but *P. vannamei* shrimp would be allowed to be cultured under strict conditions in the central and northern regions of Viet Nam. MOFI is to issue in the near future the quality criteria for *P. vannamei* broodstock, seed and testing activities.

Coastal Aquaculture Planning Guidelines

The inclusion of BMP and relevant parts of the EIA guidelines into aquaculture planning guidelines was also encouraged by the project. This was done through continuous interactions with the SUMA staff in charge of this activity and by presenting the project experiences on BMP at the Sustainable Coastal Aquaculture Planning Guideline Training Module (see 3.6 for more details).

Towards a tracing and tracking system

The early steps towards the development of an effective tracing and tracking system were also supported by the project. This was done by sharing experiences from other countries in the region (e.g. India), where traceability is now implemented by pilot farming communities as part of the efforts to produce BMP shrimp throughout the production chain, from hatcheries to farms.

Supporting the Fisheries Extension Strategy

SUMA's efforts to assist MOFI in the development of a Fisheries Extension Strategy were also supported by the project. This was done through regular consultations and meetings with members of the working group in charge of this task.

Supporting the development of a legal framework

Because strategies aimed at improving the sustainability of the aquaculture sector often require legislation to support their implementation, the project team also assisted MOFI in the development of the necessary legal framework. This is a process which requires continuous support to ensure harmonization with regional and international standards. At this scope the long-term input to the process was ensured through the regular consultation and involvement of regional and international experts, who have expressed their intention to continue supporting Viet Nam in this task. Examples of legal documents developed with the assistance of the project are:

1. Regulation on the organizational structure and functions of NACAAH
2. Regulation for testing fishery commodities
3. List of diseases for which testing of fisheries commodities moved within national borders is required
4. List of diseases for which testing of imported fisheries commodities is required
5. Regulation for the management of veterinary drugs, chemicals, probiotics and environmental treatment substances for aquaculture
6. Regulation on import and export of fisheries veterinary drugs and environmental treatment substances for aquaculture
7. Regulation for the management of safe aquaculture zones and facilities
8. Proposal for the establishment of the Aquatic animal disease prevention Fund

In addition, support was provided to RIA-2 for the development of sector standards issued by the Department of Science and Technology on

1. *Shrimp farm – Conditions for food's safety and sanitation assurance;*

2. *Shrimp farming zone - Conditions for food's safety and sanitation assurance*

Supporting the development of Environmental Impact Assessment guidelines

Support was also provided through a series of case studies and workshops to the preparation of EIA guidelines that are now with the Dept of Science and Technology for official approval. During 2005, support was provided to training courses for MOFI and provincial DOFI and DONREs staff. The finalized EIA guidelines are provided in the attached CD.

Is Viet Nam making a remarkable progress on aquatic animal health?

Like other countries in the Asia-Pacific region that contributed to the Beijing consensus 5 years ago, Viet Nam is devoting a great deal of efforts to implement the Asia regional Technical Guidelines on aquatic animal health management. Every year, the progress of the region towards aquatic animal health is reviewed by a regional Advisory Group (AG) and recommendations on the way forward developed.

Presentations on the progress made by Viet Nam were delivered to the AG in both 2004 and 2005 (i.e. throughout the lifespan of the health project). The progress made by Viet Nam and the approach used towards the development of an effective aquatic animal health management strategy were constantly praised by the AG. Recommendations were given to disseminate further the experiences gathered in Viet Nam, showing the remarkable success of the partnership between Viet Nam and the project in developing and implementing a sustainable aquatic animal health control strategy.

3.6 Wide dissemination of experiences

The project experiences were widely disseminated within Viet Nam and internationally.

Experiences were disseminated within Viet Nam mostly at meetings and workshops.

In addition to regular meetings with MOFI and DOFI personnel, the project experiences were presented at 5 national workshops which were all well attended by national and provincial-level stakeholders:

- "Reducing Risks of Aquatic Animal Disease Outbreaks: Pilot projects in Nghe An, Ha Tinh, Quang Ninh, Khanh Hoa & Ca Mau" Presentation given at the Workshop on Good Aquaculture Practices (GAP), Codes of Conduct (CoC) and Codes of Practice (CoP) for the shrimp farming and marine cages sectors in Vietnam. 5-6 August 2004, Ha Long, Viet Nam

- "Environment and Disease Monitoring in the Fisheries Sector: Pilot activities in 2005 supported by SUMA, SUFA and FMIS " Presentation given at the National workshop on Fisheries resources and Environment protection. 14-15 January 2005, Hai Phong, Viet Nam

- "SUMA, SUFA, FMIS pilot disease surveillance and environmental monitoring activities in Nghe An and 7 other provinces"
  Presentation given at the unallocated funding environmental monitoring launch workshop. 29th April 2005, Nha Trang, Viet Nam

- "Implementing an aquatic animal health management strategy"
  Presentation given at the 2nd Sustainable Coastal Aquaculture Planning Guideline Training Module. 20-24 June 2005, Hue City, Viet Nam

- "Implementing Better Management Practices in shrimp farms and hatcheries"
  Presentation given at the 2nd Sustainable Coastal Aquaculture Planning Guideline Training Module. 20-24 June 2005, Hue City, Viet Nam

Information on the project achievements were also incorporated into the many presentations delivered within Viet Nam to share experiences gathered through the SUMA component.

Over the period of the projects, 8 presentations were also delivered at 6 international workshops or meetings. Seven of these were invited by the event organizers, showing the deep interest internationally on the project activities and achievements. The presentations related to the aquatic animal disease control project were:

- "Reducing risks of aquatic animal disease outbreaks: pilot projects in Nghe An, Ha Tinh, Quang Ninh, Khanh Hoa and Ca Mau provinces of Viet Nam"
  Invited presentation given at the ACIAR Project FIS2000/061 annual coordination meeting, 20-21 July, Bangkok, Thailand

- "Experiences from Viet Nam"
  Invited presentation given at the China/FAO/NACA Workshop on healthy, safe and environmentally sound shrimp farming. 15-16 November, Beijing, P.R. China

- "Lessons learnt from ongoing NACA/SUMA project in Vietnam: regional implications for strengthening implementation of Technical Guidelines" Invited presentation given at the 3rd Meeting of the Asia Regional Advisory Group on Aquatic Animal Health. 23-25 November, Bangkok (Thailand)

- "Putting principles into practice: the Vietnamese experience on better management practices implementation"
  Invited presentation given at the World Aquaculture Society Conference. 9-13 May, Bali (Indonesia)

- "Developing a surveillance system to increase preparedness for aquatic animal emergencies in Vietnam"
  Invited presentation given at the World Aquaculture Society Conference. 9-13 May 2005, Bali, Indonesia

- "Progress in implementation of TG in Vietnam: Lessons learnt from ongoing projects and regional implications"

Invited presentation given at the 4th Meeting of the Asia Regional Advisory Group on Aquatic Animal Health. 22-24 October, Colombo, Sri Lanka

- "Limiting the impact of shrimp diseases through the implementation of Better Management Practices: the Vietnamese experience"
  Presentation given at the 6th Symposium on Diseases in Asian Aquaculture. 25-28 October 2005, Colombo, Sri Lanka

- "Codes of practice and better management: a solution for shrimp health management?"
  Invited presentation given at the 6th Symposium on Diseases in Asian Aquaculture. 25-28 October 2005, Colombo, Sri Lanka

With the contribution of the above dissemination activities, Viet Nam's efforts towards sustainable aquaculture are now widely recognized and several countries are eager to learn from Viet Nam's experience.

Sri Lanka calls Viet Nam: an Example of Effective Dissemination

The enormous progress on aquatic animal health management made by Viet Nam over the past few years is recognized by several countries in the region. Among these, Sri Lanka showed particular interest in the achievements made during the project. For this reason, the National Aquaculture Development Authority (NAQDA) of Sri Lanka requested the project team to use the experience gathered in Viet Nam to support Sri Lanka in the development of a national advisory committee, establishment of a surveillance system and implementation of BMP for shrimp hatcheries and farms. FAO, which also recognizes the progress made in Viet Nam by the project, will possibly provide the necessary financial support for these activities.

4 THE WAY FORWARD

A major focus of the projects was towards sustainability. As a result, thanks to the commitment of all the stakeholders involved, most activities conducted during these 2-years will continue or serve as a starting point for future developments. This will be in part assisted by the fact that two of the 3 Vietnamese project team members (i.e. Mr Pham Van Khang and Ms Nguyen Thi Phuong Mai) will continue their efforts towards BMP implementation by working within the MOFI system. The third staff will continue supporting Viet Nam and the region by working for NACA.

There are several examples of the sustainability of project activities. Pilot farmers declared their intention to continue applying BMPs because they are increasingly realizing the advantages of this approach in terms of quantity and quality of production.

DOFIs have expressed on several occasions their interest to support BMP implementation in the pilot communes and to extend this approach to the whole province. DOFI from both Nghe An and Ha Tinh provinces have also requested assistance from NAFIQAVED to support their efforts towards GAP implementation. As for shrimp broodstock and seed, within the next few months Ca Mau province will organize a workshop targeted at developing a strategy for the production of quality seed and DOFI has requested that the experiences gathered through the project are made available to the workshop participants.

At the national level, MOFI departments and RIAs have played a very important role in the implementation of the project activities, taking full ownership of most activities and, as stated throughout this report, there are strong signals of MOFI willingness to take the achievement of the NACA/SUMA projects forward.

In spite of all these positive signs, a lot still needs to be done.

Increasingly stringent market requirements are leading the Vietnamese aquaculture sector towards the implementation of GAP/BMP for the production of a whole range of commodities in addition to shrimp and marine fish. In this process, understanding the needs and constraints of less resourced small scale farmers is vital otherwise the social benefits of aquaculture to the many small-scale rural producers may be lost.

Implementation of GAP/BMP is still very limited compared with the number of aquaculture producers in Viet Nam, which has been estimated to be as high as 4 million. Although the effective dissemination of extension material and the development of sound regulations play an important role, widespread and sustainable implementation is dependent on the development of harmonized supporting systems.

An effective surveillance and response system need to be implemented. Although the results from the pilot activities showed deep interest from stakeholders and promising results, better strategies need to be developed to achieve an effective and timely flow of information. The work on disease also needs to be extended

to a more effective environmental surveillance system. In addition, the impact of these systems on the livelihood of aquaculture farmers should be monitored through a well structured mechanism for collecting and analysing socio-economic data.

A traceability system should also be developed to assist producers to assure quality and comply with requirements from importers. Some pilot activities were conducted in this direction in collaboration with other FSPS components, however there is the need to learn from experiences gathered in other countries in the region (e.g. Bangladesh), countries where simple traceability systems have been developed and can be complied to also by small scale producers.

To achieve the above, collaboration with regional institutions should be established and MOFI has already recognized the benefits of receiving inputs from organizations such as NACA and APAN (Asia-Pacific Advanced Networks), which can share the regional experiences in sustainable aquaculture and IT respectively.

Better availability of information will also ease the process of linking producers with importers and consumers. The international demand for products produced following practices that ensure food safety and environmental and socio-economical sustainability is soaring. Consumers however require evidence of quality and this can be provided through a system of certification. NAFIQAVED is conducting the first steps in this direction. Other schemes for certifying seafood products, e.g. ACC/GAA, organic, etc. are already in place in Viet Nam and harmonization between efforts is essential.

The newly approved 2nd Phase of the Danida-funded FSPS, which will start in January 2006, opens a major opportunity for Viet Nam to continue its efforts towards the sustainable growth of the fisheries sector. The importance of NACA's involvement in this second phase has been recognized on several occasions by both MOFI and the Danish government and, as an intergovernmental organization, NACA is strongly committed to supporting Viet Nam and other member countries to achieve the sustainable development of the aquaculture sector.

ANNEXES

ANNEX A Terms of Reference

REDUCING RISKS OF AQUATIC ANIMAL DISEASE OUTBREAK: Pilot projects in Ca Mau, Nghe An, Ha Tinh, Quang Ninh, and Khanh Hoa

1. BACKGROUND

In November 1993, the fisheries sector was selected by the Government of Vietnam and Danida as one of the three main sectors for Danish development assistance. Danida supported the formulation of the Fisheries Master Plan to Year 2010, which was accepted by the Ministry of Fisheries (MOFI) in 1998. The national objective for fisheries and the fishing industry is to contribute effectively to the improvement of the national economy and the social and economic conditions of the people. The Danida Sector Programme Support (FSPS) facilitates the implementation of the policies as stated in the Master Plan. The overall objective of the FSPS is "Environmentally and socially sustainable economic growth in the fisheries sector in line with international standards".

The Danida 'Fisheries Sector Programme Support' comprises of five components, one of them SUMA, Support to Brackish Water and Marine Aquaculture.

SUMA Component Description

Vietnam holds an enormous potential for developing brackish water and marine aquaculture and it is the vision of the Government of Vietnam (GoV) that the production of aquatic products through aquaculture will help secure the future supply of marine products required for domestic consumption and export and contribute to nutritional status, employment and alleviation of poverty of coastal peoples.

Development of sustainable brackish water and marine aquaculture is constrained by several factors. The first is lack of an effective administrative framework, and development planning which so far has placed limited consideration on ecological issues. The second is that current technologies and management systems in use for brackish water and marine aquaculture are low-input extension systems which, in some areas, have led to environmental problems and which do not tap the development potential in sustainable way. It is also true to say that Vietnam has not yet effectively tapped into the technologies available in other countries of the region (e.g. culture of some marine fishes, shellfishes) which have potential in the country. Thirdly, there is a lack of human capacity and information for effective administration and management of brackish water and marine aquaculture at all levels.

Coastal aquaculture has immense potential for improving the livelihoods of poor people in Vietnam, and is expanding rapidly in some areas. However, the industry has suffered significant setbacks in recent years in many Asian countries as a result of disease, environmental impact, and social conflict. These problems typically arise from the cumulative effects of many unplanned and unregulated, often small-scale developments.

The SUMA component is designed to address these constraints and provide a basis for future environmentally and socially sustainable development of brackish water and marine aquaculture in line with the FSPS objective.

SUMA's immediate objective is:

Strengthened administration and management practices as required to supply marine aquatic products through environmentally and socially sustainable aquaculture development.

SUMA has 6 outputs covering legal/administrative strengthening, aquaculture planning, technology development, community development/management, HRD and information dissemination. SUMA does not have an output that cover direct intervention on disease at provincial level.

Coastal aquaculture is being given a high priority by the Government of Vietnam and fish and shrimp disease outbreaks are a major constraint, causing economic damage on small and large-scale coastal farms. The risk of disease outbreaks is a major factor affecting the sustainability of coastal aquaculture and particularly threatens income of small-scale producers and investments in aquaculture made towards poverty alleviation in coastal areas. Inappropriate disease control measures (such as use of banned chemicals) is already a concern for Vietnam's trade in shrimp in export markets, and disease is being recognised an issue for future trade. For example, one country has initiated checking of shrimp imports for white spot syndrome virus, and EU has in the pipeline legislative changes that may require exporting countries to demonstrate effective health management measures; essentially requiring countries to trade product out of areas with disease control measures. Disease surveillance and reporting to demonstrate status of trading areas will be a crucial part of such systems.

White spot disease (WSD) of shrimp: a major cause of economic loss in Vietnam. Practical risk management measures can reduce impacts of the disease on coastal shrimp farms.

Shrimp disease problems occurred in all five SUMA pilot provinces in 2001 and 2002, although timely training by SUMA helped reduce impacts in 2002. This demonstrates the potential for reducing losses by introducing better health management measures. The Ministry of Fisheries (MOFI) and the Provincial governments have requested assistance from SUMA to address disease issues. Following successful interventions in 2002, Provincial authorities in SUMA pilot provinces are receptive and interested in further support to build effective provincial coastal aquaculture health management system. Basic management measures to reduce risk from shrimp disease are now fairly well established; what is needed is vigorous extension of these practices to farm level, at the same time building capacity of local farmers, farmer groups local and central institutions to address future problems.

This document concerns a pilot project for aquatic animal disease control in five provinces: Quang Ninh, Khanh Hoa, Nghe An and Ha Tinh. Depending on the results from these provinces, activities could be scaled up over a wider coastal area involving more provinces.
However as SUMA does not have an output that directly cover the disease aspects the present contract will be covered by FSPS unallocated funds and managed by SUMA.

2. OBJECTIVES

Objective:
Support the development and implementation of aquatic animal health disease control measures that reduce risk of fish and shrimp disease outbreaks and the negative impacts of such diseases on farmers and trade.

Immediate objectives:

Develop and implement practical and workable disease control systems
The consultancy concerns brackish water aquaculture and a pilot project to reduce risk of aquatic animal diseases in five provinces. The emphasis is on shrimp disease, but the principles should be more widely applicable to aquatic animal disease control in coastal areas of Vietnam.

3. OUTPUT

There are four outputs:

Output 1: Risk reduction measures in place for shrimp post-larvae
Emphasis will be placed on support to reducing the risk of introducing pathogens to the province/farms. This requires farmers, and local authorities, to adopt effective measures for screening (and possibly certification) of shrimp nauplii/post-larvae, or adopt local "biosecure" hatcheries.

Output 2: Improved farm level risk management practices
Support will be provided to identify and put in place recommendations for improving farm-level risk management practices. These requires farmers to individually, and collectively, adopt measures to reduce the risks of shrimp disease outbreaks in ponds, and common water supplies, depending on local conditions.

Output 3: Improved capacity of provincial institutions in risk management
Support will be provided to improve the capacity of provincial institutions, at local (farmer groups, village level), district level and provincial level to advice farmers in risk management.

Output 4: Effective aquatic animal disease surveillance system in place in pilot provinces
Support will be provided in the development and implementation of effective surveillance systems to monitor and respond effectively to aquatic animal disease outbreaks.

4. METHODOLOGY

The Pilot activities will be used in Vietnam to develop practical and workable disease control systems. There is a need to control risks associated with spread of pathogens between provinces, and even districts, through sensible legislation that is enforceable, and development of provincial capacity to monitor, diagnose and control serious pathogens. At the same time, urgent efforts are required to get simple information to farmers and build skills on health management to reduce risks of disease outbreaks (see box) or minimize it through early detection and simple measures. Development of practical surveillance systems is particularly important to be able to monitor and respond to serious disease problems when they occur.

"Risk management" points and strategies for white spot disease of shrimp, based on experiences within SEAsia (from AAHRI, NACA, ACIAR).

1. Minimise risk of pathogens entering ponds with infected shrimp post-larvae
    a. Screening throughout the hatchery cycle, from broodstock to post-larvae
    b. Maintaining separate stocks during hatching/nursing
    c. Good hatchery management
    d. Screening/certification of post-larval movements
    e. Screening of post-larvae prior to stocking
    f. PL nursing on extensive farms
2. Minimise risk of pathogens entering ponds during grow-out
    g. Good pond preparation practices
    h. Screening of inflow water
3. Use best practice crop planning and pond management to maintain health bottom soil and water quality
    i. Good pond preparation
    j. Seasonal stocking practices
    k. Reduced water exchange, water reservoirs on intensive farms
    l. Efficient feeding practices
4. Regular monitoring of crop health and environmental conditions
5. Intervene to control adverse conditions or emergency harvests.
6. Capacity building among supporting institutions to implement the above measures

There is a considerable amount of information on fish and shrimp disease management and control within Vietnam and elsewhere in Asia but this information has rarely been used effectively to support farmers. The constraints include lack of effective dissemination due to limited extension capacity and services (people, facilities, language, inappropriate extension tools) that support farmers and emphasis in extension services on top down technical messages rather than development of locally applied solutions and learning tools relevant to farmers. There is a need to address these constraints and work towards the dissemination of relevant "farmer first" extension messages and development of sustainable health management systems that promote farmer self-reliance and practical and sustainable support services.

At provincial level, there are many issues to be considered in the development of practical and effective systems to monitor and control spread of diseases. The basic approach should be to disseminate key messages to farmers that emphasise disease prevention through sound farm management and protection of environmental health, including reduction in use of antimicrobials and preventing use of banned chemicals. The present system of control and screening of post larvae coming in from other provinces should be strengthened, including certification procedures from other provinces. At the same time, information on serious outbreaks needs to be rapidly disseminated to minimise spread. In practice, this means having: trained people and basic diagnostic facilities in place, information systems for diseases situation and mechanisms to respond to problems when they arise and supporting policies and legislation within the broader coastal aquaculture framework. The approach to capacity building must emphasise sustainability, with support services remaining available beyond any project intervention. An important issue is that traditional government extension services will always have limited coverage, therefore there is a need to look at alternative extension with more emphasis on self-reliance and capacity building for health management among farmers and farmer groups supported by appropriate services at commune, district and provincial institutions. Local farmers and farming communities need to be trained in carrying out an effective management of aquatic health problems including shrimp.

There are also opportunities here to learn from other sectors, particularly agriculture, where there is considerable experience in, for example, integrated pest management (IPM) in development of learning tools, and innovative farmer-centred learning and knowledge dissemination methodologies, such as farmer field schools, that is being implemented by DOFI assisted by SUMA in Ca Mau province.

The pilot activity is planned for five provinces. Work in late 2003 and first half of 2004 would focus mainly in Nghe An and Ha Tinh and in 2nd half of 2004 and in 2005 in Khanh Hoa, Quang Ninh and Ca Mau for development of risk management procedures.
Experiences from these provinces will form the basis for subsequent wider dissemination of the approach to other provinces. A formal review of progress will be carried out in late 2005, prior to possible extension to other coastal provinces.

5. SCOPE OF WORK

The expected four outputs from the pilot project are listed with accompanying activities.

Output 1: Risk reduction measures in place for post-larvae
Emphasis will be placed on support to reducing the risk of introducing pathogens to the province/farms. This requires farmers, and local authorities, to adopt effective measures for screening (and possibly certification) of shrimp nauplii/post-larvae, or adopt local "biosecure" hatcheries. At provincial levels the local authorities will be supported in developing and maintaining an efficient system for control and screening of 'imported' fry and larvae before they are released as the majority of post larvae are from outside sources. The support will include strengthening the certification procedures from other provinces

Activities
This will involve the following activities:
- Review of current measures for certification/screening of shrimp seed, at farm level, and among Provincial institutions. Identification of weak points in the control.
- Identification of strategies to improve screening measures.
- Implementation of improved screening measures.
- Development of extension materials and testing with selected farmers/farmer groups.
- Support to building of capacity (eg through training, basic equipment) to implement recommended risk reduction measures.
- Working closely at pilot sites to assist farmers in implementation of risk reduction recommendations.
- Revision of recommendations based on experiences.
- Widespread dissemination of health messages among farmers and farmer groups in pilot provinces.

Work in Khanh Hoa will give particular attention to improving the quality of shrimp post-larvae from the province, including strategies for stop on use of banned antimicrobials and reduction in use of sensitive human drugs.

Output 2: Improved farm level risk management practices

Support will be provided to identify and put in place recommendations for improving farm-level risk management practices. This requires farmers to individually, and collectively, adopt measures to reduce the risks of shrimp disease outbreaks in ponds, and common water supplies, depending on local conditions.

Activities:

This will involve the following activities:

- Review of current risk reduction measures
- Identification of farm-based strategies to reduce shrimp disease risks.
- Consultation with educational and technical specialists to develop education tools for development/dissemination.
- Development of extension materials and testing with selected farmers/farmer groups.
- Working closely at pilot sites to assist farmers in implementation of risk reduction measures.
- Working closely with farmers to identify abnormal behaviour as sign of disease at an early stage and implement simple and quick measures to mitigate problems.
- Revision of recommendations based on experiences.
- Widespread dissemination of health messages among farmers and farmer groups in pilot provinces.

Output 3: Improved capacity of provincial institutions in risk management

Support will be provided to improve the capacity of institutions, at local (farmer groups, village level), district level and provincial level to advice farmers in risk management.

Activities:

This will involve the following activities:

- Participatory design of provincial health management system through individual farmer, farmer group, institutional and other stakeholder consultations. This will be based on a detailed farmer-driven needs assessment and how these relate to the roles and responsibilities of farmers and supporting institutions[3]. Special attention will also be given to the requirements of poorer farmers, and other differences between farmers and farming systems.
- Provision of basic equipment (level I diagnosis, or level II) for health and environmental monitoring at an appropriate level based on needs.

Output 4: Effective aquatic animal disease surveillance system in place in pilot provinces

Support will be provided in the development and implementation of effective surveillance systems to monitor and respond effectively to aquatic animal disease outbreaks.

Activities:

This will involve the following activities:

- Development of a surveillance system for aquatic animal diseases fore the two provinces Nghe An and Ha Tinh and later the other provinces. The work on information flow will be carried out by the 'Disease and Environmental Monitoring' work between, the Dept. of Science and Technology, RIA1, RIA2, and RIA3 and FMIS/SUMA/SUFA. This will involve close cooperation with NACA group ensuring the proper work- and information flow from provincial level and down linking with the proposed regional flow to the MOFI and RIAs. The information system will involve collection of relevant data and mechanisms and support to respond to disease problems when they occur, and ensuring the proper level of feed back on the information to the lower levels.

Identification of requirements for gradual implementation of the surveillance and health management system in the two provinces. This tentatively will include training of trainers, capacity

building, provision of basic diagnostic facilities, development of extension materials/learning tools and mechanisms.

6. PARTNERS IN THE PROJECT AND THEIR RESPONSIBILITIES

Partners

NACA will provide the technical support to MOFI, Provincial authorities and local institutions through SUMA to develop and implement the system, and also serve as a link to regional institutes and other organizations involved with shrimp health management. The Aquatic Animal Health Research Institute (AAHRI), which is a regional centre of excellence in aquatic animal health, will be a partner in this project.

The work in Vietnam will be carried out as SUMA activities and the pilot project will form part of NACA's regional initiative to control shrimp diseases in NACA member countries. Through NACA, links will be created between Vietnam and with other regional projects and international organizations, including FAO, and OIE, who are partners of NACA in the Asia-Pacific Regional Aquatic Animal Health Management Program.

Responsibilities of NACA

NACA will be involved in all phases of project development and implementation by providing specialists' input/services through the following:

- Planning and support
- Development of the disease control risk management measures
- Support to Provincial authorities, local agencies and farmers in implementation/testing of the measures.
- Participate in the training component, development of extension and training materials, learning materials and establishment of aquatic health information system.
- Participate in the evaluation and monitoring phase
- Coordinate with other partners that can provide assistance to Vietnam in aquatic animal health.
- Assist in report writing, extension materials and other publications that will result from the project
- Submitting monthly, quarterly, semiannual and annual reports corresponding to the need of Vietnamese authorities and Danida demands.

Responsibilities of SUMA

The Support to Marine and Brackishwater Aquaculture (SUMA) of the MOFI/Danida FSPS programme will provide financial and administrative support to NACA to implement the pilot project. The project will also be implemented in close cooperation with the ongoing SUMA support and training in both provinces. The detailed responsibilities and means of coordination will be detailed during an inception mission at the start of the project. Local transport (car) for NACA project staff will be provided through the local SUMA project offices[4] in each province where possible.

Costs for equipment, local workshops, and publication of local training materials for provinces are also estimated , and will be paid for by SUMA based on recommendations from NACA.

Inputs required

The inputs required can be divided into:

- Provinces: Funds will be required to support training/workshops and provision of facilities (e.g. Provincial PCR tools, basic test kits etc). The requirements will be detailed during the early part of the project for funding by SUMA.
- NACA. A contract will be made between SUMA and NACA to support the required technical and related administrative support. A part-time regional health management specialist will be assigned to coordinate the project in Vietnam, supported by technical back-stopping from the NACA Secretariat in Bangkok.

ANNEX B Assessment of project achievements through the examination of 2004 and 2005 work-plans

WORKPLAN 2004 (taken from the project document)

Output 1: Risk reduction measures in place for shrimp post-larvae		
Activities	**Status**	**Evaluation**
▪ Review of current measures for certification/screening of shrimp seed in Nghe An and Ha Tinh	Achieved	Satisfactory
▪ Identify success/weak points in the control systems.	Achieved	Very Satisfactory
▪ Identify risk management practices with potential to improve screening and reduce risk of infected/poor quality shrimp seed being stocked into farmer ponds	Achieved	Very Satisfactory
▪ Prepare strategy to implement risk reduction measures for shrimp post-larvae in Nghe An and Ha Tinh, and support requirements and measures as appropriate	Achieved	Very Satisfactory
▪ Select pilot sites and work closely at pilot farm sites to assist farmers in implementation of risk reduction recommendations	Achieved	Satisfactory
▪ Implement institutional support requirements, such as training, equipment, development of extension materials, support to building of capacity to implement recommended risk reduction measures	Achieved	Satisfactory
▪ Monitor and evaluate risk reduction measures with selected farmers/farmer groups	Achieved	Very Satisfactory
▪ Review experiences with farmers and local institutions at end of cropping season	Achieved	Very Satisfactory
▪ Revise recommendations based on experiences.	Achieved	Satisfactory
▪ Prepare for widespread dissemination of health messages among farmers and farmer groups in Ha Tinh and Nghe An in 2005.	Achieved	Satisfactory
▪ Hatchery study initiated in Khanh Hoa to assess current practice and opportunities to improve quality of shrimp PLs produced	Achieved	Satisfactory
Output 2: Improved farm level risk management practices		
Activities	**Status**	**Notes**
▪ Review current risk reduction measures in consultation with farmers and local institutions	Achieved	Satisfactory
▪ Preparation of farm-based strategies to reduce shrimp disease risks.	Achieved	Very Satisfactory
▪ Prepare risk reduction strategy for farm level risk management in Nghe An and Ha Tinh, including workplan for 2004, farm level activities and institutional responsibilities and support requirements, and support measures such as training, equipment requirements, extension materials as appropriate.	Achieved	Satisfactory
▪ Consult with educational and technical specialists to develop education tools for development/dissemination	Achieved	Satisfactory
▪ Develop extension materials and test with selected	Achieved	Very satisfactory

farmers/farmer groups.		
▪ Working closely at selected pilot sites to assist farmers/farmer groups in implementation of risk reduction measures.	Achieved	Satisfactory
▪ Monitor and evaluate risk reduction measures with selected farmers/farmer groups.	Achieved	Satisfactory
▪ Review experiences with farmers and local institutions at end of cropping season	Achieved	Very Satisfactory
▪ Revise recommendations based on experiences.	Achieved	Satisfactory
▪ Prepare for widespread dissemination of health messages among farmers and farmer groups in Ha Tinh and Nghe An	Achieved	Satisfactory
Output 3: Improved capacity of provincial institutions in risk management		
Activities	**Status**	**Notes**
▪ Participatory design of provincial health management system in Nghe An and Ha Tinh.	Achieved	Satisfactory
▪ The plan would be developed through consultations with individual farmer, farmer group, institutional and other stakeholders.	Achieved	Satisfactory
▪ Provision of basic equipment (level I diagnosis, or level II) for health and environmental monitoring at an appropriate level based on needs.	Achieved	Satisfactory
Output 4: Effective aquatic animal disease surveillance system in place in pilot provinces		
Activities	**Status**	**Notes**
▪ Review of existing surveillance systems/plans for aquatic animal diseases for Nghe An and Ha Tinh.	Achieved	Satisfactory
▪ Preparation of strategy for gradual implementation of the surveillance and health management system in the two provinces.	Achieved	Very Satisfactory
▪ Provision of equipment, training of trainers, capacity building, provision of basic diagnostic facilities, development of extension materials/learning tools and mechanisms as appropriate.	Achieved	Satisfactory
▪ Pilot testing of a surveillance system in (possibly 2) selected farming areas/farmer groups.	Achieved	Very Satisfactory
▪ Monitor and evaluate surveillance system with selected farmers/farmer groups.	Achieved	Satisfactory
▪ Review experiences with farmers and local institutions at end of cropping season	Achieved	Satisfactory
▪ Revise recommendations based on experiences.	Achieved	Satisfactory
▪ Prepare for wider development of surveillance system in Ha Tinh and Nghe An in 2005.	Achieved	Satisfactory
Output 5: Communications and information exchange on better health management practice		
Activities	**Status**	**Notes**
▪ Regular email updates on progress/problems will be circulated from the pilot provinces in Nghe An and Ha Tinh to other provinces throughout 2004. Links will be made with regional information sources on shrimp health, and translation of relevant materials to Vietnamese.	Partially achieved	Satisfactory
▪ Efforts will be made to communicate activities at Nghe An and Ha Tinh as appropriate	Achieved	Satisfactory

WORKPLAN 2005 (taken from the SUMA 2005 workplan)

Output 1: Risk reduction measures in place for shrimp post-larvae		
Activities	**Status**	**Notes**
▪ Disseminate better management practices (BMP) to hatcheries through training courses	Achieved	Very Satisfactory
▪ Develop extension material on hatchery BMP	Achieved	Very Satisfactory
▪ Conduct WSSV testing of PL in pilot farmers groups	Achieved	Satisfactory
▪ Disseminate BMP to broodstock suppliers	Partially Achieved	Satisfactory
▪ Disseminate BMP to middlemen	Partially Achieved	Satisfactory
▪ Conduct an epidemiological study of PL health	Achieved	Satisfactory
▪ Pilot trial on production of polychaetes as shrimp broodstock feed	Achieved	Satisfactory
Output 2: Improve farm level risk management practices		
Activities	**Status**	**Notes**
▪ Conduct farmers meetings to disseminate BMP	Achieved	Satisfactory
▪ Develop extension material for farmers	Achieved	Very Satisfactory
▪ Support simple aquatic animal health and environmental monitoring equipment to pilot farmers	Achieved	Satisfactory
Output 3: Improve capacity of provincial institutions in risk management		
Activities	**Status**	**Notes**
▪ Train provincial staff on PCR and shrimp health problem detection	Achieved	Satisfactory
▪ Conduct diagnostic validation trials	Cancelled because of budget readjustments	
▪ Support equipment to implement aquatic animal disease control (including 2 PCR sets)	Achieved	Satisfactory
Output 4: Develop effective aquatic animal disease surveillance system in pilot provinces		
Activities	**Status**	**Notes**
▪ Support equipment and consumables to develop and implement diseases surveillance system	Achieved	Satisfactory
▪ Conduct training on disease detection, reporting and control	Achieved	Satisfactory
▪ Conduct meetings and workshops to monitor and evaluate the implementation of the surveillance system	Achieved	Very Satisfactory
Output 5: Widely communicate and exchange information on better health management practice		
Activities	**Status**	**Notes**
▪ Translate relevant health management material into Vietnamese	Achieved	Satisfactory
▪ Post updated material on the project experiences on NACA and SUMA websites	Achieved	Satisfactory
Output 6: Support national level efforts to control aquatic animal disease outbreaks		
Activities	**Status**	**Notes**
▪ Conduct meetings with stakeholders to discuss aquatic animal health strategies	Achieved	Very Satisfactory
▪ Support participation of national level stakeholders to training courses and workshops	Achieved	Very Satisfactory

ANNEX C List of training courses

No	Title of the training	Training field	Date of beginning	Date of ending	Target	Number of trainees
1	Training on pond preparation and seed quality selection	BMPs implementation	22-Mar-04	22-Mar-04	Shrimp farmers in Ky Hai commune	45
2	PCR training in Nghe An ARP	PCR proceeding	23-Mar-04	23-Mar-04	Staff of ARP- NgheAn RIA1-CuaLo	5
3	Training on pond preparation and seed quality selection	BMPs implementation	24-Mar-04	24-Mar-04	Shrimp farmer in Ho Do commune	70
4	Training on pond preparation and seed quality selection	BMPs implementation	25-Mar-04	25-Mar-04	Shrimp farmer in Quynh Bang commune	90
5	Training on pond preparation and seed quality selection	BMPs implementation	26-Mar-04	26-Mar-04	Shrimp farmer in Quynh Loc, Dien Van commune	120
6	PCR training in Nghe An ARP	PCR proceeding	28-Mar-04	28-Mar-04	Staff of ARP- NgheAn RIA1-CuaLo	5
7	Training on pond preparation and seed quality selection	BMPs implementation	29-Mar-04	29-Mar-04	Shrimp farmers in Xuan Dan commune	30
8	PCR training in Nghe An ARP	PCR proceeding	30-Mar-04	31-Mar-04	Staff of ARP Nghe An	4
9	PCR training in Nghe An ARP	PCR proceeding, testing sample	4-Apr-04	6-Apr-04	Staff of ARP- NgheAn	4
10	Training on health management and pond management	BMPs implementation	26-Apr-04	26-Apr-04	Shrimp farmer in Quynh Loc	120
11	Training on health management and pond management	BMPs implementation	28-Apr-04	28-Apr-04	Shrimp farmer in Quynh Bang commune	90
12	Training on health management and pond management	BMPs implementation	4-May-04	4-May-04	Shrimp farmer in Xuan Dan commune	30
13	Training on health management and pond management	BMPs implementation	5-May-04	5-May-04	Shrimp farmer in Ky Hai commune	40
14	Training on health management and pond management	BMPs implementation	6-May-04	6-May-04	Shrimp farmer in Dien Van commune	40
15	Training on health management and pond management	BMPs implementation	7-May-04	7-May-04	Shrimp farmer in Ho Do commune	75
16	Training on BMPs for Hatchery	BMPs implementation			Shrimp hatchery technical people	35
17	Training on BMPs for Farm	BMPs implementation	21-Jun-04	24-Jun-04	Extension worker of Nghe An and Ha Tinh DOFI	40

No	Title of the training	Training field	Date of beginning	Date of ending	Target	Number of trainees
18	BMPs for hatcheries	BMPs implementation	28-Feb-05	13-Mar-05	DOFI Khanh Hoa: 6; DOFI CM 3; DOFI NA 2, UoF 2, BMP hatcheries 2, NAFIQAVED 2, RIA 2: 1	18
19	Intensive shrimp culture	AFFS	2-Mar-05	4-Mar-05	TOT in Ca Mau	4
20	Detection of shrimp diseases by clinical signs	Shrimp health management	5-Mar-05	6-Mar-05	commune extension workers, district workers and DOFI (Nghe An)	42
21	Detection of shrimp diseases by clinical signs	Shrimp health management	7-Mar-05	8-Mar-05	commune extension workers, district workers and DOFI (Ha Tinh)	18
22	Shrimp disease diagnosis by PCR method	Shrimp health management	12-Mar-05	13-Mar-05	Testing center officers of Quang Ninh	3
23	Hands-on training on shrimp sample testing by PCR	Shrimp health management	7-Apr-05	7-May-05	1 from ARP of Nghe An and 1 from ARP of Ha Tinh	2
24	General assessment of seed quality and detection of P. monodon diseases using malachite green stain method	Shrimp health management	10-Apr-05	11-Apr-05	8 district fisheries and 1DOFI officer of Nghe An province	9
25	General assessment of seed quality and detection of P. monodon diseases using malachite green stain method	Shrimp health management	12-Apr-05	13-Apr-05	8 district fisheries and 7DOFI officer of Ha Tinh province	15
26	Quick detection of white spot and yellow head diseases in P. monodon	Shrimp health management	24-May-05	25-May-05	8 district fisheries and 1DOFI officer of Nghe An province	9
27	Quick detection of white spot and yellow head diseases in P. monodon	Shrimp health management	30-May-05	31-May-05	8 district fisheries and 4 DOFI officer of Ha Tinh province	12
28	Training on pond book use	BMPs implementation	22-Jun-05	25-Jun-05	Farmers from 21 communes of Nghe An	420
29	Training on pond book use	BMPs implementation	June-05	June-05	Farmers from 5 communes of Ha Tinh	100
30	Detection of shrimp diseases by clinical signs (1 day)	Shrimp health management	August-05	August-05	Commune extension workers, district workers in CaMau	10
31	Detection *P. monodon* diseases using microscope	Shrimp health management	27-Sep-05	28-Sep-05	District extension workers in Ca Mau	5
	TOTAL					**1510**

ANNEX DList of equipment and status

Item	Quantity	Status
Beneficiary: DOFI Nghe An		
UV Transilluminator Model: D82152 / Uniequip – Germany	1	OK
Digital Camera Model: CyberShort DSC-P200 / Sony – Japan	1	OK
Micro-pipette Eppendorf- Germany	1	OK
Micro-pipette racks Model: F161401 / TreffLab- Switzerland	3	OK
Eppendorf racks TreffLab- Switzerland.	6	OK
Deep Freezer Froger – Denmark	1	OK
Light microscope Model: CX21 / Olympus – Japan	1	OK
Light microscopes Model: XSF8S 1600X / China	4	OK
Microwave ovens Japan	1	OK
Beneficiary: DOFI Ha Tinh		
PCR Thermal Cycler Model: Mastercycler Gradient / Eppendorf – Germany	1	OK
DNA workstation Uniequip – Germany	1	OK
Cold Centrifuge Model: 5415 / Eppendorf – Germany	1	OK
Horizontal electrophoresis system Model: AO - 200 / Uniequip – Germany	1	OK
Electrophresis power supply Model: Unipack Uniequip – Germany	1	OK
UV Transilluminator Model: D82152 / Uniequip – Germany	1	OK
Automatic double water distiller Model WSC/4D / Bibby – England	1	OK
Digital Camera Model: CyberShort DSC-P200 / Sony – Japan	1	OK
Vortex mixer Model: Unimax ZX3 / Uniequip – Germany	1	OK
Analytical Balance Model:CTG 1200 / Japan	1	OK
Micro-pipettes TreffLab- Switzerland	8	OK
Micro-pipette racks Model: F161401 / TreffLab- Switzerland	3	OK
Eppendorf racks TreffLab- Switzerland	6	OK
Deep Freezers Froger – Denmark	2	OK
Light microscope Model: CX21 / Olympus – Japan	1	OK

Item	Quantity	Status
Light microscopes Model: XSF8S 1600X / China	4	OK
Microwave ovens Japan	1	OK
Beneficiary: DOFI Quang Ninh		
DNA workstation Uniequip – Germany	1	OK
UV Transilluminators Model: D82152 / Uniequip – Germany	2	OK
Digital Cameras Model: CyberShort DSC-P200 / Sony – Japan	2	OK
Micro-pipettes Genex Beta- Germany	4	OK
Micro-pipette racks Model: F161401 / TreffLab- Switzerland	3	OK
Eppendorf racks TreffLab- Switzerland	12	OK
Deep freezers Model: MDF 136 / Sanyo- Japan	2	OK
Microwave ovens Japan	2	OK
Beneficiary: DOFI Ca Mau		
PCR Thermal Cycler Model: Mastercycler Gradient / Eppendorf-Germany	1	Being delivered
DNA Workstation Model: UV PCR Workstation / UVP – USA	1	Being delivered
Centrifuge Model: Eppendorf 5415D / Eppendorf – Germany	1	Being delivered
Horizontal electrophoresis system Model: Mini-SubCell GT system / BioRad – USA	1	Being delivered
Electrophoresis power supply Model: PowerPac Basic / Bio-Rad – USA	1	Being delivered
UV Transilluminator Model: Fist Light UV Illuminator / UVP – USA	1	Being delivered
Automatic double water distiller Model WSC/4D / Hamilton – England	1	Being delivered
Digital Camera Model DSC-W1 / Sony – Japan	1	Being delivered
Vortex mixer Model: Minishaker MS1 / IKA – Germany	1	Being delivered
Analytical Balance Model AR 2140 / Ohaus – USA	1	Being delivered
Micro-pipettes Eppendorf – Germany	7	Being delivered
Deep Freezers (- 30oC) Model MDF - U333 / Sanyo – Japan	2	Being delivered
Light Microscopes Model: MBL 2000 / AKRUSS- Germany	3	Being delivered
Microwave Oven Sharp Corporation	1	Being delivered
Beneficiary: DOFI Khanh Hoa		
PCR Thermal Cycler Model: Mastercycler Gradient / Eppendorf-Germany	1	Being delivered

Item	Quantity	Status
DNA Workstation Model: UV PCR Workstation / UVP – USA	1	Being delivered
Centrifuge Model: Eppendorf 5415D / Eppendorf – Germany	1	Being delivered
Horizontal electrophoresis system Model: Mini-SubCell GT system / BioRad – USA	1	Being delivered
Electrophoresis power supply Model: PowerPac Basic / Bio-Rad – USA	1	Being delivered
UV Transilluminator Model: Fist Light UV Illuminator / UVP – USA	1	Being delivered
Automatic double water distiller Model WSC/4D / Hamilton – England	1	Being delivered
Digital Camera Model DSC-W1 / Sony – Japan	1	Being delivered
Vortex mixer Model: Minishaker MS1 / IKA – Germany	1	Being delivered
Analytical Balance Model AR 2140 / Ohaus – USA	1	Being delivered
Micro-pipettes Eppendorf – Germany	7	Being delivered
Deep Freezers (- 30oC) Model MDF - U333 / Sanyo – Japan	2	Being delivered
Microwave Oven Sharp Corporation	1	Being delivered

Note: Equipment marked as "Being delivered" is equipment for which the delivery was delayed because of financial constraints. The equipment is expected to arrive within 1 month from the printing of this report and arrangements have already been made to allow the optimal set-up of the equipment and the training of the people who will be using it. The people in charge of these activities will be Nguyen Hoang Dieu (Khanh Hoa) and Nguyen Vinh Nghi (Ca Mau).

ANNEX E List of people supported by the project to attend international events

No	Training course/Workshop	Host Country	Date	Participant - Workplace/Position
1	72nd Workshop of OIE in France	France	18-30 May 2004	Nguyen Tu Cuong - Director of NAFIQAVED Le Dinh Hung - Director of NAFIQAVED 4 Nguyen Thanh Binh - NAFIQAVED
2	Capacity building for ASEAN protection from invasive aliens and transboundary disease infecting organisms	Malaysia	12-17 Jul 2004	Nguyen Tu Cuong - Director of NAFIQAVED Le Dinh Hung - Director of NAFIQAVED 4
3	Workshop on Preparedness for aquatic animal disease outbreak in Asia and exchange experience on the establishment of National advisory committee for aquatic animal health	Indonesia	20-26 Sep 2004	Nguyen Xuan Ly – Dept. of Science and Technology Nguyen Tu Cuong - Director of NAFIQAVED Doan Van Dai - Department of Aquaculture Phan Thi Van - RIA1 Ly Thanh Loan - RIA2 Le Thi Hue - NAFIQAVED
4	Responsible shrimp farming with consideration on quality assurance and environment protection	China	15-16 Nov 2004	Nguyen Tu Cuong - Director of NAFIQAVED
5	Antibiotics in aquaculture environment	Thailand	23-26 Feb 2005	Nguyen Nhu Tiep - Head of Veterinary Div - NAFIQAVED Tran Bao Ngoc - NAFIQAVED 2 Le Nguyen Cao Tan - NAFIQAVED 3 Nguyen Truong Huy Dat - NAFIQAVED 4 Nguyen Dinh Xuan Quy - NAFIQAVED 6
6	Regional consulting workshop on *P. vannamei* and exotic shrimps in the Philippines	Philippines	27 Feb - 4 Mar 2005	Le Duy Binh - NAFIQAVED 4
7	Training on Taura and Koi Herpes virus detection in fish and shrimp	Philippines	6-13 Mar 2005	Dao Thanh Tam - NAFIQAVED 4 Nguyen Dinh Truyen - NAFIQAVED 6
8	World Aquaculture Society 2005	Indonesia	9-14 May 2005	Nguyen Tu Cuong – Director of NAFIQAVED
9	Shrimp health management	India	26 Jun -1 Jul 2005	Le Duy Binh - NAFIQAVED 4

No	Training course/Workshop	Host Country	Date	Participant - Workplace/Position
10	Shrimp health management and diagnostics	US	17 Jun - 4 Jul 2005	Pham Minh Thu - NAFIQAVED
11	Diseases in Aquaculture in Asia N. 6	Sri Lanka	24-29 Oct 2005	Nguyen Thi Tuong Vy - NAFIQAVED 2 Pham Van Khang - RIA1
12	Shrimp health management	Thailand	2-9 Oct 2005	Hoang Hai Hoa - NAFIQAVED Nguyen Viet Khue - RIA1 Cao Thanh Trung - RIA2 Hoang Thi Hien - RIA2 Vo Van Nha - RIA3
13	Workshop on the alternatives for Chloramphenicol	Malaysia	15-19 Nov 2005	Nguyen Nhu Tiep - Head of Veterinary Div - NAFIQAVED

ANNEX F List of material included in the CD

No	Title
	Folder 1: Reports
1a	NACA/SUMA Project Completion Report - EN
1b	NACA/SUMA Project Completion Report - VN
2a	SUMA Component Completion Report - EN
2b	SUMA Component Completion Report - VN
	Folder 2: Reports of specialists
1	Hatchery specialist report - EN
2	Shrimp farming specialist report - EN
3a	Polychaete specialist report - EN
3b	Polychaete specialist report - VN
	Folder 3: Presentations
1	Presentation at the ACIAR Project FIS2000/061 meeting, Bangkok, Jul 2005-EN
2	Presentation at the China/FAO/NACA Workshop on healthy, safe and environmentally sound shrimp farming, Beijing, Nov 2004-EN
3	Lesson learnt from NACA/SUMA project in Vietnam: Presentation at the 3rd Meeting of the Asia Regional Advisory Group on Aquatic Animal Health, Bangkok, Nov 2005-EN
4	Vietnamese experience on BMP implementation: Presentation at WAS, Bali, May 2005-EN
5	Surveillance system: Presentation at the WAS, Bali, May 2005-EN
6	Progress of TG implementation in VN – Regional AG meeting, Colombo 2005 - EN
7	BMP implementation: Vietnamese experience – Presentation at 6th Symposium on Diseases in Asian Aquaculture, Colombo, 2005-EN
8	Code of practice and better management-Presentation at the 6th Symposium on Diseases in Asian Aquaculture, Colombo, 2005-EN
9	Presentation at the Workshop on GAP, CoC for the shrimp farming and marine cages, Ha Long- Viet Nam, 2005-EN
10	Presentation at the National workshop on Fisheries resources and environment protection, Hai Phong, Vietnam, Jan 2005 – EN
11	Presentation at the environmental monitoring launch workshop, Nha Trang, Vietnam, Apr 2005-EN
12a	Aquatic animal health strategy: Presentation at the 2nd Sustainable Coastal Aquaculture Planning Guideline Training Module, Hue, Vietnam, Jun 2005-VN
12b	Aquatic animal health strategy: Presentation at the 2nd Sustainable Coastal Aquaculture

No	Title
	Planning Guideline Training Module, Hue, Vietnam, Jun 2005-EN
13a	BMP in shrimp farms and hatcheries: Presentation at the 2nd Sustainable Coastal Aquaculture Planning Guideline Training Module, Hue, Vietnam, Jun 2005-VN
13b	BMP in shrimp farms and hatcheries: Presentation at the 2nd Sustainable Coastal Aquaculture Planning Guideline Training Module, Hue, Vietnam, Jun 2005-EN
	Folder 4: Legal documents
1a	Decision of Minister of Fisheries No263-NACAAH-VN – Establishment of NACAAH
1b	Decision of Minister of Fisheries No263-NACAAH-EN – Establishment of NACAAH
2	Regulation on the organizational structure and functions of NACAAH-VN
3	Regulation for testing fishery commodities-VN
4	List of diseases for which testing of fisheries commodities moved within national borders is required-VN
5	List of diseases for which testing of imported fisheries commodities is required-VN
6	Regulation for the management of veterinary drugs, chemicals, probiotics and environmental treatment substances for aquaculture-VN
7	Regulation on import and export of fisheries veterinary drugs and environmental treatment substances for aquaculture-VN
8	Proposal for the establishment of the Aquatic animal disease prevention Fund-VN
9	BMP guidelines for marine fish –EN
10a	EIA Guidelines-VN
10b	EIA Guidelines-EN
11a	Sector standards-Shrimp farming zone – Conditions for food's safety and sanitation assurance-EN
11b	Sector standards-Shrimp farming zone – Conditions for food's safety and sanitation assurance-VN
12a	Sector standards- Shrimp farm – Conditions for food's safety and sanitation assurance-EN
12b	Sector standards- Shrimp farm – Conditions for food's safety and sanitation assurance-VN
	Folder 5: Surveillance system
1a	Disease surveillance system – description - EN
1b	Disease surveillance system – description - VN
2a	Instructions for commune extension workers-EN
2b	Instructions for commune extension workers-VN
	Folder 6: Extension materials
1a	Leaflet on 10 steps for shrimp pond preparation (final)-VN

No	Title
1b	Leaflet on 10 steps for shrimp pond preparation (draft)-EN
2a	Leaflet on 10 steps for stocking preparation and good seed selection (final)-VN
2b	Leaflet on 10 steps for stocking preparation and good seed selection (draft)-EN
3a	Leaflet on 10 steps for good pond management (final)-VN
3b	Leaflet on 10 steps for good pond management (draft)-EN
4a	Leaflet on 10 steps for good shrimp health management-VN
4b	Leaflet on 10 steps for good shrimp health management-EN
5	Booklet on BMP for semi-intensive shrimp farming in Vietnam-VN
6a	Booklet on GAP for intensive culture-VN
6b	Booklet on GAP for improved extensive culture-VN
7a	BMP hatchery manual-VN
7b	BMP hatchery manual-EN
8a	Leaflet for broodstock supplier (final)-VN
8b	Leaflet for broodstock supplier (draft)-EN
9a	Leaflet for PL traders (final)-VN
9b	Leaflet for PL traders (draft)-EN
10a	Guide to small-scale marine finfish hatchery technology-VN
10b	Guide to small-scale marine finfish hatchery technology-EN
11a	Asian Diagnostic Guide – VN
11b	Asian Diagnostic Guide – EN
12a	Pond book for shrimp farmers (Khanh Hoa)-VN
12b	Pond book for shrimp farmers (Nghe An, Ha Tinh, Ca Mau, Quang Ninh)-VN
13	Surveillance system - Recording and coding book for normal observations-VN
14	Surveillance system - Recording and coding book for abnormal observations-VN
15	Asia Regional Technical guidelines on aquatic animal health -EN