Limiting the Impact of Shrimp Diseases through the Implementation of better Management Practices: the Vietnamese experience

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ABSTRACT

Through a collaborative project between the Vietnamese Ministry of Fisheries, the Network of Aquaculture Centres in Asia-Pacific and the Fisheries Sector Programme Support funded by the Danish International Development Assistance, better management practices (BMPs) for shrimp farming were developed and disseminated to 5 provinces of Viet Nam. The implementation of BMPs was promoted to 655 households and monitored in 269 ponds distributed over 6 communes in 2 provinces. The BMPs were well accepted by farmers and implemented to different extents. Data collected at the end of the 2004 crop indicated that ponds in which BMPs were applied had a significantly lower risk of experiencing mortality, higher yields, and higher probability of making a profit. Testing of seed for white spot syndrome virus before stocking, as conducted by groups of farmers, showed remarkably positive outcomes. The results are discussed in the contexts of experiences gathered from other BMPs projects in the Asian region.

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INTRODUCTION

The growth of the aquaculture sector over the past few decades and its ability to respond to the increasing global demand for fisheries products have been remarkable. Shrimp farming is a clear example of this outstanding development. During the last 10 years, shrimp production worldwide more than doubled. Although extraordinary, these aggregated data do not express the degree of growth of some countries like Viet Nam, where shrimp harvests showed a 4-fold increase in the 1998-2003 period only (FAO, 2006).

This rapid development came at a cost and the need for a more sustainable approach to improve shrimp health and quality while reducing the environmental impact of operation became clear to several stakeholders. A Consortium Program involving the Food and Agriculture Organization of the United Nations (FAO), the Network of Aquaculture Centres in the Asia-Pacific (NACA), the World Bank (WB) and World Wildlife Fund (WWF) was initiated in 1999 and was later joined by the United Nations Environment Program (UNEP). Through this program, principles for responsible shrimp farming were developed following a process of stakeholder consultations (FAO/NACA/UNEP/WB/WWF, 2006). At the same time, Better Management Practices (BMPs) to help farmers in the implementation of those principles were also developed and their implementation by farming communities promoted (NACA, 2006). A remarkable example came from India, where BMP adoption significantly contributed to improving shrimp yields and controlling the impact of shrimp diseases (Padiyar *et al.,* 2008).

Facing a compelling need to control shrimp diseases such as White Spot Disease (WSD), which constantly claimed a huge share of shrimp harvests, and the resulting quality problems associated with the use of banned chemicals and antibiotics, the Vietnamese Ministry of Fisheries (MOFI) took a leading role in promoting more sustainable approaches to shrimp farming. This was done by taking part in stakeholder consultations for the development of the Consortium Program principles and by supporting both directly and indirectly the implementation of BMP approaches.

Since 2003, MOFI, NACA and the Fisheries Sector Programme Support (FSPS) funded by the Danish International Development Assistance (DANIDA) began supporting the development and implementation of BMPs in small-scale shrimp farming systems in Viet Nam, with the target to improve both quality and quantity of shrimp harvests.

This paper describes the process of BMP development, dissemination and implementation and reports an assessment of the effect of BMP implementation on shrimp health and yield.

MATERIALS AND METHODS

Selection of study sites

The MOFI/NACA/FSPS project promoted BMP implementation and more sustainable approaches to shrimp health management at all levels (from the national-level to farmers). Activities were conducted primarily in 5 coastal provinces, namely Quang Ninh, Nghe An, Ha Tinh, Khanh Hoa and Ca Mau. In 2004, BMP implementation was supported and

monitored in 6 communes located in 2 of these provinces: Nghe An and Ha Tinh. Pilot communes were selected primarily by provincial fisheries authorities primarily because of their need for assistance and the recurrent shrimp health problems. In 5/6 communes, all the ponds in the commune were selected. Because of the large number of pond in one commune, 2 groups of farmers were selected with the assistance of commune authorities and following the criteria for commune selection. A total of 269 ponds were selected for BMP implementation.

BMP development

BMPs were developed to target improvements to the following aspects of sustainability:

- shrimp health by focusing on prevention, monitoring and more specific treatment of health problems;
- food safety through building awareness on banned substances and on practices to effectively replace the need for antibiotics;
- environment protection by limiting the amounts of wastes discharged in the environment;
- social equity by increasing communication between farmers and other resource users so that the needs of all stakeholders could be addressed.

In addition to the above, strong focus was given to promoting the establishment of farmer groups. Main incentives for farmers to work as groups included:

- reduced costs associated with seed testing, purchasing of inputs (seed, feed, etc.);
- improved collaboration and sharing of experiences between farmers;
- increased awareness on shrimp health problems occurring within the group;
- improved management of water supply and discharge;
- stronger link with government extension services and officials, which liaise with 1 unit (the group) instead of liason with individual farmers;
- better bargaining power when selling harvested products.

BMPs were designed to be simple, practical, affordable and cost-effective. Special attention was given to addressing the needs of small scale producers.

The process of BMP development started with the establishment of an expert team composed by international, regional and national shrimp health specialists. The team conducted farm visits and used BMP documents and other technical manuals to draft 4 sets of BMP to address: pond preparation, seed selection and stocking, pond management under normal conditions, and shrimp health management. BMPs were then discussed with local authorities and farmers and their comments included as appropriate.

BMP dissemination

BMPs were disseminated using a wide range of methods. A total of 4 sets of leaflets were developed and disseminated to all the farmers in the pilot communes. Leaflets were later incorporated into a single booklet which was further disseminated to the pilot farmers. Pond books, primarily aimed at allowing record keeping but also containing key BMP messages, were also distributed to all the farmers. Farmer meetings at which

BMPs were presented and discussed were held in every commune before and during the production cycle at an average of 3-4 meetings per commune. All ponds were visited at least on a fortnightly basis and more often with rising health problems. During pond visits, pond-specific BMPs were disseminated. While visiting farming sites, effort was put to interact particularly with voluntary extension workers. These were farmers selected by a group for their higher technical knowledge and willingness to share their expertise with other farmers. Voluntary extension workers conducted additional BMP dissemination sessions through their interactions with other farmers. Indirect BMP dissemination was also achieved by conducting training courses for government extension workers and involving them in project activities. BMP dissemination was also conducted at the end of the production cycle.

Supporting BMP implementation

Although limited, some support towards BMP implementation was also given to farmers in the pilot communes. Free WSSV-testing of seed batches was offered through a provincial testing laboratory. Magnifying lenses to assess post-larval quality, kits for testing water pH and alkalinity, densitometers and thermometers were distributed to voluntary extension workers. Pond books and extension material were also provided free of charge to farmers. The total cost of the support given to the pilot communes amounted to an estimated US$1 dollar per farmer for the whole production cycle.

Monitoring BMP implementation and effect

Management practices adopted by farmers were measured using an interview-based questionnaire delivered at the end of the crop; data collected only on the first crop conducted in 2004. The questionnaire also collected data on the occurrence of shrimp health problems, size of harvest and perceived profit made from the crop. Questionnaires were delivered to either the farmer or a member of the household who contributed to the management of the pond. Data were collected on all the 269 ponds in the 6 pilot communities.

Statistical analysis

Data collected using the survey questionnaire were used to assess whether specific BMP had been implemented. Three BMP messages, representing BMP implementation and the ease of measurement, were selected for analysis, as follows:

- Remove waste soil before stocking (measured directly as categorical (dichotomous) variable).
- Do not plough a pond with acid soil [measured combining information on soil type (categorical) and on whether the pond had been ploughed or not (categorical, dichotomous)].
- Test shrimp seed for White Spot Syndrome Virus (WSSV) and stock only negative seed (measured by combining information of WSSV testing and on whether WSSV positive seed had been stocked).

Crop success was measured using 3 outcome variables, namely:

- occurrence of shrimp mortality (categorical, dichotomous)
- shrimp yield per hectare (continuous)
- perceived profit made from the crop (categorical with 3 levels: loss, break-even, profit)

Statistical analysis was conducted using *Chi*-square and t-test for categorical and continuous outcomes respectively (Minitab). Relative Risk (RR) was used to quantify the strength of association between BMP implementation and the occurrence of mortality.

RESULTS

BMP implementation was significantly associated with a lower risk of experiencing shrimp mortality, higher shrimp yields per hectare and higher probability of making a profit (Tables 1-3).

Table 1. Association between lack of BMP adoption and the occurrence of shrimp mortality

BMPs not followed	RR of experiencing mortality	p-value
Remove waste soil	1.36	0.001
Do not plough acid soil ponds	1.36	0.022
Test seed for WSSV	1.74	< 0.001

Table 2. Association between BMP adoption and shrimp yield per hectare

BMP followed	Kg/ha BMP	Kg/ha non-BMP	p-value
Removing soil	385	123	< 0.001
Do not plough acid soil ponds	73	42	0.023
Test seed for WSSV	452	112	< 0.001

Table 3. Association between BMP adoption and the perceived profit made from the crop. Percentages indicate the proportion of ponds in which a certain BMP was adopted in the 3 categories of ponds, i.e. where loss, break-even or profit was made.

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

DISCUSSION

These results clearly indicate that simple and practical BMPs can be effectively disseminated to communities of small-scale shrimp farmers and can significantly contribute to improving shrimp health and yields.

The effect of WSSV testing was particularly remarkable, with yields 4 times higher in ponds where WSSV negative seed was stocked. This is particularly outstanding especially in view of the fact that ponds stocking WSSV-negative seed were compared with ponds stocking un-tested seed, which could also have been negative. Corsin *et al.* (2005) reviewed the risk factors associated with WSD, indicating that testing of seed for WSSV was not always reported to be effective as a practice to control the disease, especially in open systems, which adopt heavy water exchange. Although the farming system used for BMP implementation in this project was an open system, we believe that the risk for WSD was reduced not only by the mere WSSV testing of the seed, but by a combination of other factors. Tested seed was generally stocked by groups of neighboring farmers, therefore reducing the chances of experiencing WSD in the whole group, consequently reducing also the probability that any pond in the group could be infected by a neighboring pond. In addition, the BMP used in analysis were only some of the BMP being disseminated. Therefore, it is reasonable to think that farmers, in addition to the BMP analysed (*e.g.,* testing seed for WSSV), also adopted other practices that reduced the risk of experiencing WSD. The same argument should be applied when interpreting the effect of all the BMPs used in analysis, therefore highlighting that the main finding of this study was not quantifying the effect of BMP implementation, but identifying that BMP implementation represents a practical and cost effective approach towards shrimp health management in Viet Nam.

Although in this study only univariate analytical methods were used (*i.e.* the association between BMPs and outcome was not adjusted for the effect of other variables), preliminary multivariable analyses confirmed the direction of the results presented above, indicating that the observed association between BMP implementation and the outcome variable was not a result of the confounding effect of other variables (*e.g.,* degree of intensification, etc.).

CONCLUSION

The results presented in this paper show that the implementation of BMPs may represent the way forward for controlling health problems and improving production in small-scale shrimp farming systems in Viet Nam. This can be achieved while improving the quality of the harvested products and limiting the environmental impact of farming operations.

As a follow up to the project described in this paper, several efforts were conducted in Viet Nam towards the implementation of more sustainable practices for shrimp farming. Similar results were achieved by those efforts, confirming the usefulness of adopting BMP approaches.

Although promising, several challenges still lie ahead. The shrimp farming sector in Viet Nam is dominated by hundreds of thousands of farmers, which are difficult to reach with extension (or BMP) messages. The legal and institutional frameworks to allow BMP implementation still need improvement. In addition, farmers of BMP shrimp do not get higher prices for their products, and are therefore deprived of an important incentive for BMP implementation.

These challenges, however, are fully recognized by the Government of Viet Nam, which is continuing to take steps towards the responsible production of shrimp and other aquaculture commodities.

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