

AQUACLIMATE TECHNICAL BRIEF

Vulnerability and Adaptation to climate change and extreme climatic events: the case of improved extensive shrimp farming in Ca Mau and Bac Lieu provinces, Vietnam: Analysis of stakeholder perceptions

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Extreme climatic/weather events and climate change has both negative and positive impacts. In the coastal provinces of Vietnam, salt water intrusion has affected rice farmers, but, at the same time, it provides an opportunity to diversify into multi-cropping of rice and shrimp culture, which is more profitable than only rice culture. On the other hand, shrimp farming itself is vulnerable to extreme climatic/weather events and climate change impacts as evidenced from our study in Ca Mau and Bac Lieu provinces. Climate change poses a number of challenges for shrimp farmers for which a number of adaptation measures have been identified. Generally, small-scale shrimp farming in Ca Mau and Bac Lieu is still considered a viable option.

Vulnerability and Adaptation to climate change and extreme climatic events: the case of improved extensive shrimp farming in Ca Mau and Bac Lieu provinces, Vietnam: Analysis of stakeholder perceptions

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Abstract

In Vietnam, small scale farmers and other stakeholders involved in aquaculture perceive that climate changes such as frequent extreme weather events have serious impacts on their farming systems (Udaya Sekhar *et al.* 2009). The present study in Ca Mau and Bac Lieu provinces showed that shrimp farmers perceived too much rain, high temperature, canal/river/sea level rise, irregular weather and storms as the most serious concerns. Risk rankings of the different climate changes in Ca Mau and Bac Lieu Provinces also prioritise the seriousness of each of the climate changes that the farmers identified. High temperature and irregular weather (encompasses temp., rainfall etc) according to farmers cause serious losses for shrimp farming, followed by too much rain, sea level rise and storms.

Farmers, over the years have started to adapt, by changing the management practises to suit the changing climate such as water management, upgrading the pond dyke, and use of lime, probiotics and other chemicals. In addition, a number of institutional such as provision of budget for climate change response for aquaculture, aquaculture area planning and monitoring, government financial support (loans), policy on mangrove planting for coastal protection and development of farmer associations have been introduced that are important to assist farmers to adapt to climate change.

There is still uncertainty in our understanding of the climate change impacts. The government agencies and farmers need to be better prepared to address future impacts from climate change.

Introduction

Vietnam's topography, climate and long coastline makes it particularly vulnerable to climate changes particularly extreme climatic/weather events and natural disasters. Analysis by Dasgupta et. al. (2007) suggests that Vietnam is one of world's top five most vulnerable countries to sea level rise and the most vulnerable to climate change impacts in South East Asia. In 2006-2007, Vietnam experienced typhoons, floods and droughts in an unprecedented manner causing severe losses to property and infrastructure. Both, agriculture and aquaculture and the livelihoods they support were severely impacted by these extreme weather events. Vietnam is also exposed to strong storms / cyclones; almost none of the coastline is considered "cyclone-free" (Kelly & Adger 2000).

Mapping impacts and vulnerability, developing adaptation strategies at the national and local levels, strengthening stakeholders' capacity and institutions to manage risks from climate

change is important to protect livelihoods of millions of small scale farmers. This cannot be done without actively involving stakeholders in impact assessment and scenario development. Stakeholder perceptions and knowledge towards climate change will provide a better understanding of the situation and developing need based adaptation measures.

The AQUACLIMATE project emphasizes stakeholder participation in all phases of the project through various methods including stakeholder workshops, focus group meetings and key stakeholder interviews.

Stakeholder Participation

A participatory approach provides a basis for effective management of natural resources. Participation of stakeholders can be used to integrate knowledge and experience of stakeholders to identify the problems, needs and priorities and to enhance the quality of solutions for adaptation (Clark 1996; Renard 1986).

Fact box

The Mekong Delta of Vietnam (MKD) has a high potential for development of both Agriculture and Aquaculture. Shrimp farming is a large industry in Vietnam, exporting 209,567MT of shrimp, worth 1.567 billion US dollars to 84 markets worldwide, accounting for 39.4 percent of the country's total seafood value in 2009 (VASEP, 2009). Though Japan and the U.S. were two largest shrimp importers with US\$493.7 million and US\$395.4 million respectively, exports to these two markets decreased by 1.1 percent and 15.4 percent compared with the same period of 2008. Tiger shrimp (*Penaeus monodon*) is the most produced shrimp species in Vietnam and has the highest value of production 1.3 billion US dollars in 2008.

Shrimp farming is prevalent along the coastal areas and in particular the two provinces Ca Mau and Bac Lieu, located on the southern most tip of Vietnam on the Mekong Delta. These two provinces have the most area under culture and production volume and value.

In areas where source of water is largely freshwater in the rainy season and brackish in the dry season, farmers typically practice multi-cropping of rice with shrimp culture (Fig. 1), growing a crop of rice concurrently with shrimp in the wet season and only shrimp in the dry season. In areas where brackish and saline water occurs thought the year crops of shrimp without rice are typical.

Tiger shrimp is typically poly-cultured with mud crab (*Scylla paramamosain*) and yields 120 and 35 kg/ha/year, respectively. Farmers practice multiple (monthly or bi-monthly) stocking and harvesting of shrimp.

To gain stakeholder participation, participatory rural appraisal (PRA) methods were used including focus group discussion (FGD), mapping crop and seasonal calendar, to capture qualitative information, in addition risk assessment, farm production and economic information were also collected. A stakeholder workshop was conducted to bring together the key shrimp farming stakeholders to discuss and develop suitable adaptation measures.

FACILITATED GROUP WORK

Methodology

A two day workshop was held at the Research Institute for Aquaculture #2 sub-station in Ca Mau. The methodology for group work at the workshop was participatory in nature. Detailed methodology has been discussed in Nagothu *et al.* (2009).

On the first day of the workshop, a FGD was conducted with shrimp farmers only, who were separated into two groups based on location (provinces) Ca Mau and Bac Lieu, to map farmers' perception of extreme climatic/weather events and climate change and their impacts on their shrimp farming operations. The second day of the workshop included other stakeholders who devised adaptation measures, that the farmers can do for themselves and the scientific, institutional and policy measures that could help farmers to adapt (Fig. 2).

OUTCOMES

Focus Group Discussion: Risk ranking by shrimp farmers

In Ca Mau, shrimp farmers rated the irregular weather as the highest risk and it was ranked as a "high" risk. The others in decreasing risk rating order were hot weather, storms and water level rise which were all considered as "medium" risk. In Bac Lieu, shrimp farmers perceived high temperature as an "extreme" risk, too much rain and storms as a "high" risk.

Farmers' perception of risk varied between the commune groups.

Stakeholder Workshop: Farmers group

The key climate change impacts observed by shrimp farmers were identified as:

Hot weather causing high temperatures and large variations in water temperature from day to night; canal / river water level rises causing damage to farm infrastructure including pond dykes, sluice gate and other facilities; storms with heavy rain and wind causing rapid environmental changes, disease and erodes pond dykes; irregular seasonal changes causing poor water quality and shrimp stress and disease.

Some suggested solutions to climate change impacts included: maintaining better water quality through alterations of pond water levels; planting trees on pond dykes to stabilize it and reduce damage and provide shade to reduce the impacts from hot weather; improved weather forecasting, through radio weather warnings and harvesting shrimp prior to the arrival of severe storms, better crop calendars for storm impacts; reducing stocking density, culturing new species and practicing polyculture, using smaller ponds for the impacts related to irregular seasonal changes.



Fig. 1 Shrimp rice farmer in Vietnam

Stakeholder Workshop: Technical and scientific group

Shrimp farming stakeholders suggested scientific measures that could help adapt shrimp farming to the climate change impacts that farmers identified.

Measures suggested to combat hot weather and resulting water quality problems included: identifying suitable trees and mangrove planting, pond wetlands, polyculture, and demonstration farms to show improved pond engineering and design to farmers. Demonstration farms were considered most urgent.

Measures suggested to combat river / canal water level rise included: analyzing historic data, setting up monitoring station for water level recording, early warning systems, identification of pollution types and sources that impact on aquaculture when flooding occurs and research on engineering aspects of pond design. Historic data and monitoring station on water level for early warning was considered most urgent.

Measures suggested to combat storms included: information on sluice gate design, and early weather forecasts, more research on coastal erosion and recovery and restoration of coastal areas. Research on coastal erosion recovery was considered most urgent.

Research and scientific measures suggested to combat irregular season and associated water quality problems included: research on better quality seed and seed testing, research on environmentally tolerant aquatic aquaculture species and training course on water quality management. All of these topics were considered to be urgent.

Measures suggested to combat too much rain and associated water quality and disease problems included: research on new technology, culture practices at different salinity levels, research about pond natural food chains.

Stakeholder Workshop: Policy and institutional group

Two sub-groups work shopped policy and institutional measures; a mixed group and an all policy people group.

Mixed group

The mixed group identified existing and needed measures. Existing measures included: consideration of available budget for research



Fig. 2 Shrimp farming stakeholder meeting group discussion.

on climate change by the central government, aquaculture planning & monitoring and policy on mangrove planting by Department of Agriculture and Rural Development (DARD), financial support from the Central Government and implemented by DARD and farmer associations with contact with extension stations.

Measures that the group thought are needed in the future include: the provision and exchange of information and training of trainers on climate change to Vietnamese agencies such as DARD for policy development. Policy support was thought to be needed for maintaining shrimp prices, establishing shrimp cooperatives, establishing shrimp disease inspection centre and shrimp pond and natural water body water quality monitoring centre and on monitoring of the quality of chemicals, commercial feeds and probiotics (the efficacy of probiotics in a commercial setting particularly growout operations is controversial).

A policy/government agencies group

The following measures were identified: DARD to provide climate change information and training to farmers, fund basic research on the potential impacts of climate change so that they can have a scientific basis for setting priorities, forecasting potential changes, develop adaptation measures and mitigating aquaculture contribution to greenhouse gas.

The central government has already recommended the provision of finance and

credit to farmers and this is awaiting approval. The central and local governors need to consider the available budget for planning culture areas as well as certification the culture areas.

There is a need to identify the responsibilities of provincial and district governments in conducting adaptation measures.

In addition, the government need to plant mangrove forests and construct the surrounding dykes in the coastal line to protect the communities from storms and sea level rise. The current strategy for aquaculture development needs revision to incorporate new measures into National Policy and Regulations. Institutional capacity at all levels need to be developed to address impacts from climate change.

These can then be passed to provincial DARD and other agencies for implementation. There is a need for research fund and investment in infrastructure such as dykes and sluice gate maintenance, water supply sources, mangrove replanting and land use planning.

The centres for monitoring environment and diseases play important roles in early warning outbreak diseases and environmental impacts for shrimp farming and need to be maintained or improved.

The Southern Hydrometeorology Centre, Ca Mau and Bac Lieu to work with TV stations provide accurate information on weather forecast.

Climate change scenarios need to be developed for predicting the potential climate changes in 20 years time. The changes may be different to those predicted so there needs to be adaptive management of the sector.

Training material needs to be revised and improved to include new materials for extreme climatic/weather events and climate change. The extension workers need to be updated with their knowledge and skills to enable them to transfer information not only on techniques but also in policy, as the culture areas will be certified or certification of the products need to be done in the near future. The training of the trainers (TOT) method could be applied to help

transferring techniques to farmers effectively and on time.

Community and farmer associations need to understand the policy and strategy for sustainable development and adaptation measures to extreme climatic/weather events and climate change. Improved cooperation among farmers is needed to deal with the changes of climate and impacts on communities. Therefore, the farmer associations need to be clustered and organised, in order to enable them to be more effective as places for sharing their experiences and information on shrimp aquaculture activities as well as weather forecast and crop seasons and other benefits. Other organisations that can be involved include the shrimp association, fishery association and women's union.

The present aquaculture production models need to be reviewed as adaptation will require new shrimp farming models to be developed to cope with more rain and high temperature and irregular weather events.

It needs to improve the net working among stakeholders in dealing with potential climate changes. It also needs to be a link among all involved stakeholders such as policy makers, scientists, central and local governors, officers, food processing plants, hatcheries, seed suppliers, middle men and farmers.

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The Technical Brief series communicate the results from the project into practical and useful information for stakeholders, especially scientists and managers.

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