Vulnerability and adaptation to climate change for small-scale polyculture farming systems: Adaptation measures for farmers in the Mekong Delta, Viet Nam

Technical brief

Key messages

- FOOD BASKET OF THE MEKONG DELTA: Shrimp production accounts for 75.74% of national production, almost from small-scale farming systems. The industry is very important for over 17 million people in terms of food security and employment.

- IMPACTS OF CLIMATE CHANGE: Aquaculture and also other industries have been threatened by high temperature, storm and typhoon, sea level rise and irregular seasons.

- THE NEED TO ADAPT TO CLIMATE CHANGE: Adaptation measures are identified to increase resilience and enhance the adaptive capacities of small-scale aquaculture farmers to the impacts of climate change.

- FARMERS AND SCIENTISTS COPING WITH CLIMATE CHANGE: This brief suggests measures that both farmers and scientists can take to help producers adapt faster and more efficiently to the impacts of climate change.

Technical recommendations

- DEEPEN THE PONDS BY DIGGING IN THE PLATFORM AREA AND USING THE SOIL TO INCREASE POND DYKE HEIGHT: Increasing the depth of ponds will reduce fluctuations in temperature and provide a cooler refuge zone at the bottom during hot spells.

- IMPROVE POND DESIGN: Adding a nursery area in ponds to raise postlarvae and juveniles will increase their survival on release to the main pond and improve production.

- ADAPT AND IMPROVE CROP CALENDAR FOR CHANGING CLIMATE: Crop calendars need to be adjusted to avoid the new peak high temperatures to reduce thermal stress and make use of warmer cool season to improve growth.

- STRENGTHEN AND INCREASE FARM PERIMETER DYKE HEIGHT: Increasing the height and strength of permiter dykes will improve the resistance of the farm to flooding, storm surge and extreme tides and reduce the risk of stock loss.

- IMPROVE POSTLARVAE AND JUVENILE QUALITY: Stocking high quality, healthy seed will improve the probability of survival and capacity of the animals to resist suboptimal water quality and other environmental stresses.

- PLANT SHADE TREES AND FLOATING PLANTS IN THE PONDS: Use of shade plants can reduce pond water temperatures, reducing thermal stress during hot spells.

- INTEGRATED CULTURE SPECIES: The productivity of these polyculture systems can be improved through selective stocking of complementary species that will provide additional income and diversification of the crop.

Improved polyculture and climate change

This brief summarises the results from the interdisciplinary study conducted within the Aquaclimate project in Ca Mau and Bac Lieu provinces of the lower Mekong Delta looking at the impacts of climate change on small scale improved polyculture systems. The brief further provides guidelines for policy development to address the climate change impacts on small scale improved polyculture farming in Vietnam and how adaptation measures should be implemented in the region. The guidelines are based on recommendations from stakeholders including farmers.

Viet Nam is one of world's top five most vulnerable countries to sea level rise and the most vulnerable area to climate change impacts in the Mekong Delta. Mapping impacts and vulnerability, devising adaptation strategies at the national and local levels and strengthening the capacity of rural farming communities to manage the impacts of climate change are now a matter of urgency. This is more relevant for vulnerable sectors such as aquaculture which provides employment to a large number of small scale farmers and poor households.

Improved polyculture farming systems in the lower Mekong delta is practiced through different production systems ranging from large scale intensive, semi-intensive and extensive. The extensive or "improved extensive" system where some modifications/improvements have been made to the pond system, is the largest production system type, both in area and production in the lower Mekong Delta. About 90% of production in Ca Mau and 55% in Bac Lieu province come from the improved extensive farming system. It is characterised by small-scale farmers and vulnerable to climate change.

Improved polyculture farming in both provinces plays an important role for food security and employment. Income from improved polyculture farming accounted for 77% of the total household income.

Climate change impacts in the Mekong Delta in 2020 and 2050

The average monthly rainfall in the Mekong River catchment area will be similar to the present rainfall in 2020. However the total rainfall in the Mekong River Delta area will not change significantly but the intensity of rainfall will increase. Saltwater will intrude further into the Mekong River Delta and river salinity will increase from December to March. However, peak rainfall is predicted to be 10% higher in August, potentially increasing the peak river flow. This together with rising sea level could increase the intensity of floods, and increase the area affected slightly. Sea level is also projected to increase substantially. It may rise about 28 – 33cm by 2050 and about 65 – 100cm by 2100. There would be 12.8% flooded area of the Mekong Delta under sea level rise at 65cm scenario; 19% (sea level rise at 75cm scenario) and 37.8% (sea level rise at 100cm scenario).

Average monthly maximum temperatures are predicted to increase by 0.7°C by 2020 and 1.32°C by 2050 respectively. There will also be hot weather spells for longer periods. The present peak average temperature, which occurs in April, will be exceeded for two and a half months and the present average maximum monthly temperature in April is predicted to be 1.5°C higher than present which poses significant risks. However, increased temperature between July and February will be positive for improved polyculture farming leading to better food conversion rate and faster growth rate.

Inundation maps of the Mekong Delta for different sea level rise scenarios show 12.8% of the Mekong Delta will be flooded under a sea level rise at 65cm scenario; 19% under a 75cm sea level rise and 37.8% under a sea level rise of 100cm. Salt water usually penetrates further inland during the dry season, up to 60km, specifically from March to May. This may impact the farming systems and productivity in the coastal region in both negative and positive ways. Storms and typhoons will happen more frequently and be stronger.

The Aquaclimate Project is a three year initiative to strengthen the adaptive capacities of rural farming communities to the impacts of climate change. The project focuses on small-scale aquaculture in Vietnam, the Philippines, India and Sri Lanka. The project is coordinated by the Network of Aquaculture Centres in Asia-Pacific and funded by the Ministry of Foreign Affairs, Norway, through the Royal Norwegian Embassy, Bangkok, Thailand. The project was undertaken by international partners Bioforsk, Norway, Akvaplan-niva Norway, Kasetsart University, Thailand and local case study partners. The local partner for this case study was the Department of Aquaculture, Research Institute for Aquaculture No. 2, HCMC, Vietnam.

Technical brief farmer and scientist measures

Deepen the ponds by digging in the platform area and using the soil to increase pond dyke height

Increasing temperatures and temperature fluctuation will cause higher pond water temperatures and increasing variation in temperature between day and night. Deepening the ponds is will assist in maintaining temperature and reducing fluctuations, as well as providing a cooler area close to the bottom of the pond when temperatures are the highest in the afternoon. Soil removed from the platform area can also be used to increase the height of pond dykes, reducing the risk of

stock escaping during storms, floods and extreme tides. Local farmers can undertake this adaptation measure as part of routine pond maintenance and repair.

Improve pond design

Improving pond design by including a nursery area (about 10% of the pond) will increase survival rates and juvenile quality. Postlarvae at stage 15 (PL15) should be held in the nursery area for about one month with supporting feeding and aeration, then released into the grow out pond. Including a semi-intensive or intensive shrimp production area within the pond can help recycle nutrients in the system and minimise pollution and risk of disease, thereby improving productivity and profitability.

Farmers need guidance in improving pond design from research institutes such as RIA No. 2 with demonstration ponds to test and prove the technology and increased productivity. The farmers may need better access to finance to undertake the necessary changes in pond design and water recirculation.

Adapt and improve crop calendar for changing climate

With increasing temperatures it is predicted that peak pond water temperatures will reach 35oC in 2020 and 36oC by 2050. This poses a high risk due to lower oxygen levels (especially at night), increased thermal stress for the stock, changes in pond productivity and increased potential risk of disease. However increasing water temperatures between June and January will have benefits to the farmer by increasing growth rate, improved pond productivity and reducing the incidence of white spot. There will be the need to alter the crop calendar to be able to take advantage of the increased productivity in the cold season and avoid the high risk in April. Farmers will need assistance from research institutes such as CTU and RIA2 to develop and test the new improved crop calendars.

Strengthen and increase farm perimeter dyke height

It is predicted that there will be a slight increase in the severity and extent of freshwater flooding due to more water passing through the Mekong River together with periodic strong rainfall. In addition there will be increasing sea level rise and storm surges leading to increased seawater flooding. Therefore there is a need to strengthen and heighten the farm perimeter dykes and improve sluice gates to prevent dyke damage and loss of stock. Additional precautions such as the use of nets on the dykes to prevent the escape of stock will also be needed.

Farmers will need to invest in dyke strengthening and purchase of nets and so there will be need for easier access to credit. Access to calamity insurance will be required to assist farmers to recover production and economic profitability due to these extreme events. The Department of Agriculture and Rural Development (DARD) should facilitate access to credit and crop insurance through discussions with banks and agriculture insurance companies and seeking their assistance for the sector.

Improve postlarvae and juvenile quality

Increasing water quality fluctuations and thermal stress could trigger increasing incidence of disease. Good quality high health post larvae and juveniles are more hardy and tolerant of suboptimal water quality and rapid water changes in water quality parameters, increasing the probability of good survival during production.

DARD should encourage local hatcheries to improve post larvae and juvenile production through adoption of better management practices and good aquaculture practice or accreditation and DARD should ensure that hatcheries regularly test their production to ensure that they are free of serious pathogens. Farmers should form farmer groups/clubs or clusters and seek to jointly purchase screened, high health postlarvae or juveniles from accredited hatcheries.

Plant shade trees and floating plants in the ponds

Pond shading can reduce maximum peak water temperatures and reduce diurnal (day/night) temperature fluctuations. Mangroves can be planted on the pond platform and floating plants planted in the deeper pond water areas.

There should be research undertaken to determine the optimal species for planting, the optimal location in the pond and the amount of pond area to be shaded. This research should be carried out by a research institute such as RIA2.

Integrated culture species

Farmers try to improve profitability by reducing operation costs or controlling feeding to economically optimised levels. Selection of high value species that can be grown together with shrimp should also be considered to improve profit. Candidate species for polyculture include milkfish, Asian seabass, giant freshwater prawn, snakeskin gourami and tilapia.

There should be research undertaken to determine the optimal species stock combination for improved extensive polyculture farming. This research should be carried out by a research institute such as RIA2 and CTU.

Summary of recommendations for key stakeholders

Stakeholder group	Recommendations
Farmers in Bạc Liêu and Cà Mau provinces	• Increase the height and strength of perimeter dykes. • Deepen ponds. • Plant shade trees and floating plants.
Banks and insurance companies	• Provide farmers with access to credit to strengthen farm infrastructure (dyke, sluice gate, irrigation system, net) and loans for shrimp farming and purchase of necessary equipment such as pumps and aerators.
Scientists, research institutes and universities such as the Research Institute for Aquaculture No. 2 and Can Tho University.	• Investigate candidate species for polyculture with shrimp. • Research ways to reduce and mitigate flooding. • Improve pond design. • Research use of floating plants and shade trees to reduce water temperature. • Adjust crop calendars to adapt to climate change. • Establish a network of local technical persons to support farmers on farm.
Government	• Improve electricity grid and access to power for farms. • Improve weather forecasting and warning system. • Seek implementation of better management practices, disease screening and health accreditation of hatcheries.


ĐẢNG CỘNG SẢN VIỆT NAM QUANG VINH MUÔN NĂM!
VIỆN NGHIÊN CỨU NUÔI TRỒNG THỦY SẢN II
PHÂN VIỆN NGHIÊN CỨU THỦY SẢN MINH HẢI
HỘI THẢO
TÁC ĐỘNG CỦA BIẾN ĐỔI KHÍ HẬU ĐẾN NTTS
(HỘI THẢO CÁC BÊN LIÊN QUAN)
WORKSHOP
IMPACTS OF CLIMATE CHANGE IN AQUACULTURE
(STAKEHOLDERS WORKSHOP)
TP Cà Mau, ngày 15 - 16/10/2009