Vulnerability and adaptation to climate change for catfish farmers in the Mekong Delta: Science and technology adaptation solutions

Science and technology brief

Science and technology needs

- TRAINING FARMERS AND STAFF: Training related to climate change adaptation for catfish aquaculture should be offered for farmers and technical staff in the Mekong Delta. This should be implemented by the Department of Agriculture and Rural Development assisted by Universities and Institutes in the Mekong Delta.

- VACCINE DEVELOPMENT FOR TREATMENT OF MAJOR DISEASES AND HEALTH MANAGEMENT IN CATFISH: Vaccines should be developed for serious diseases, which may become more prevalent as catfish come under increasing environmental stress related to climate change, and as an alternative to use of chemical treatments. This research should funded by governments, NGOs and animal health companies.

- IDENTIFYING SPECIES FOR POLYCULTURE IN CATFISH POND: Research on candidate species for polyculture should be conducted by scientists to salvage feed waste, reduce water pollution in catfish ponds and offer farmers an opportunity for diversification.

- SELECTIVE FISH BREEDING FOR SALINE AND ENVIRONMENTAL TOLERANCE: The possibility of developing salt-tolerant strains of catfish should be investigated by universities and research institutes to increase fish tolerance to saline water intrusion and associated environmental changes.

- IMPROVING FINGERLING QUALITY: Universities, research institutes and government and private hatcheries should investigate ways to improve the quality of fingerlings for catfish farmers with a view to maintaining fish production under climate change conditions.

Role of science and technology

While farmers can adapt to small changes in weather patterns and short-term gradual climate change they are not prepared for rapid changes or long term continuous climate change. Farmers need to be assisted by scientific research and technology development to find solutions that will allow them to adapt to the predicted future climate change.

There is a need for scientific research to understand the underlying biological processes that are affecting productivity changes due to climate change and to develop potential solutions for the farmer. This includes research on subjects such as the effect of temperature on breeding and fry fitness and the selective breeding of temperature and salt tolerant stains. In addition, there is a need for scientific research to better understand climate change and its potential impacts to support informed decision making by central, regional and provincial governments.

Science & technology stakeholder workshop.

Catfish and climate change

Viet Nam is one of world's top five most vulnerable countries to sea level rise and the area most vulnerable to climate change impacts is 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 that provide employment to a large number of small scale farmers and poor households.

Significance of catfish farming

A major part of Viet Nam's aquaculture production, both for domestic and export markets is the striped catfish known locally as "ca tra". In 2011 total production reached 1.35 million tonnes from a production area of 5,430 ha. Approximately 660,000 tonnes of catfish were exported, generating foreign exchange of US$ 1.427 billion (VASEP, 2011, D-Fish, 2012).

Catfish farming involves a diversity of stakeholders including farm owners, caretakers, processing plants (where women are > 70% of the work force), traders, seed and feed sellers and middlemen. An Giang is the most important catfish farming province in the Mekong delta with about 5,000 households involved, followed by Dong Thap and other delta provinces.

It is estimated that about 30-40,000 poor landless people are directly working in catfish farming at various levels, in addition to people involved indirectly. On an average, each hired labourer working on fish cages and ponds earns about VND 550,000-650,000 per month. Catfish also contributes as a source of protein to the local communities. Given this dependency, it is important to improve the adaptive capacity of the people involved in the sector.

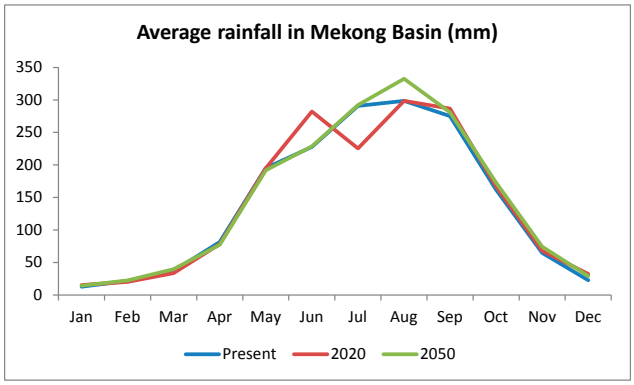
Impacts of climate change on catfish farming

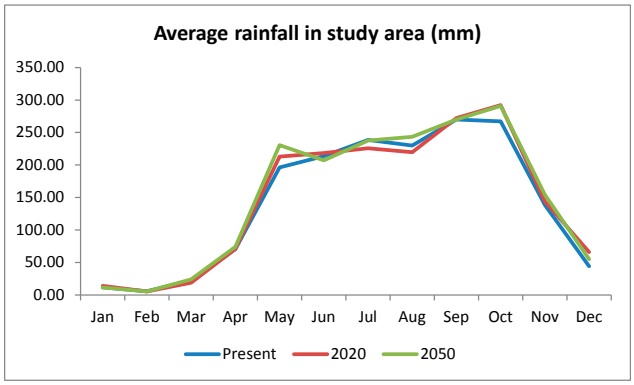
Rainfall in the Mekong river catchment and river flow

The predicted monthly precipitation in the Mekong River catchment area is predicted to be fairly similar between the present and 2020. However, peak rainfall is predicted to be 10% higher in the month of August meaning that at peak river flow, 10% additional water may be passing down the river. This together with the increasing sea level will increase the risk of floods. Since the Mekong is already heavily dammed, with many more dams planned and under construction. Peak river flow may therefore be controlled by 2050 resulting in less flooding than predicted but slightly increased the case study provinces.

Rainfall in case study areas

Rainfall in case study provinces is predicted to be very similar to present levels in 2020 and 2050. Although no significant change is expected in terms of total rainfall and seasonality of rainfall, the IPCC (2007) predicted that when rainfall occurs it will be heavier i.e. there will be stronger downpours of rain.





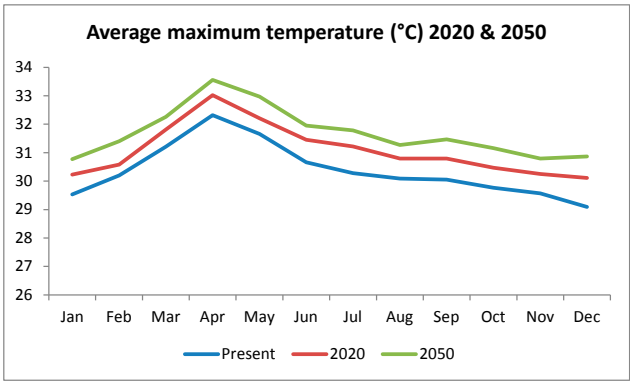
Temperature

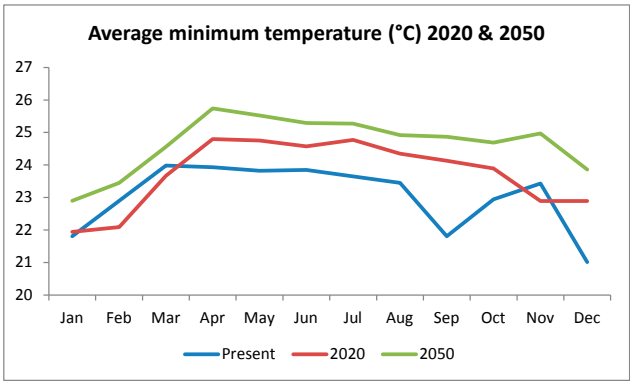
The average monthly maximum temperature is predicted to rise with time. It is predicted that average monthly maximum temperatures will increase by 0.7°C by 2020 and 1.32°C by 2050 and that present maximum monthly temperatures will be the same temperature or more for 2.5 months (March to May).

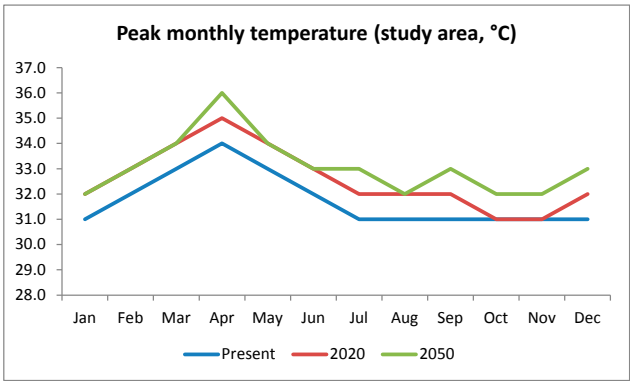
The peak maximum temperatures are predicted to increase in April. Average monthly maximum temperatures will increase by 0.93°C by 2020 and 1.33°C by 2050. Peak monthly temperatures will be 1°C higher (35°C) in 2020 and 2°C higher (36°C) in 2050. Peak temperatures could cause thermal stress for catfish as well as low water oxygen levels and possibly impact on pond productivity.

The average monthly minimum temperature is also predicted to rise. Catfish may benefit from warmer temperatures between June and January leading to

improved growth rate, improved pond productivity and reduced white spot disease outbreaks.







Sea level rise

Sea level is predicted to rise with time. If the observed sea level rise continues at the present rate then sea level could be 2cm higher in 22 and cm higher in 2.

This in conjunction with increased storms will mean stronger and more frequent storm surges and seawater ooding of farms close to the coast and in low lying areas.

Increasing sea level rise will also result in increased saltwater intrusion into the Mekong river delta area with increasing salinity December to March and increasing salinity deeper into the delta, reducing the availability of suitable areas for catfish farming.

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 Viet Nam, the Philippines, India and Sri Lanka. This brief provides a summary of the project's work with catfish farmers in the Mekong Delta. It highlights the policy implications, research agenda and on farm adaptations that will be required to sustain the industry and its contribution to the livelihoods of poor farmers and food security. 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, the Department of Aquaculture, Can Tho University and Research Institute for Aquaculture No. 2, Ho Chi Minh City, Viet Nam.

Science and technology adaptation measures

Training farmers and staff

Knowledge on climate change impacts and adaptation are necessary for catfish farmers and government staff to reduce vulnerability and negative impacts in catfish culture. Farmers and staff need to be trained by now for further climate change adaptation.

In order to mitigate and prevent climate change impacts in catfish culture, training courses for farmers and staff or workshop on measurement and mitigation of climate change impacts in catfish farming need to be organized by DARD, University or/and Institution as soon as possible to help farms and local staff (district level) to avoid negative impacts of climate change, vulnerability in catfish culture in the Mekong Delta. This could be help farmers to reduce risk and improve catfish production as well as reduce economic loss in future.

Vaccine development for major diseases and fish health management

Vaccines are the best way to avoid serious diseases in catfish culture and needed to mitigate increasing health problems associated with climate change impacts.

Vaccine development is a key factor to prevent fish disease outbreaks and increase fish resistance, especially under increasing environmental stress related to climate change such as irregular weather changes, prolonged hot and cool spells. Vaccines can help reduce fish disease, reduce mortalities and increase production in catfish culture while reducing use of chemical treatments. Vaccines need to be produced and developed by scientists and animal health companies to help sustain the long term development of the catfish industry in the Mekong Delta.

Identifying species suitable for polyculture

Polyculture offers opportunities to increase utilisation of wastes in catfish farming, reduce water pollution and diversify production.

In order to maximise feed uptake in catfish ponds and optimise feed management, identifying candidate species for polyculture in catfish ponds should be conducted to reduce feed waste. Cool spells and heavy rain lead to catfish fish stop feeding and increase feed waste and thereby also water pollution, reducing the yield of the farm. This activity should be implemented by universities and institutes to optimise feed utility and defray feed cost in catfish farming. Research on application of aeration in ponds to generate oxygen in deeper layers of the pond is also required.

Selective breeding of catfish for salt and environmental tolerance

Selection of catfish for higher salt and environmental tolerances in anticipation of increasing saline intrusion due to sea level rise and climate change needs to be conducted to mitigate impacts and sustain the long term development of the catfish industry.

Tra catfish are a primary freshwater species that has been stocked in inland areas of the Mekong Delta, Vietnam. At present, the issue of water salt intrusion in downstream zones such as Ben Tre, Tra Vinh and Soc Trang limits catfish culture in the freshwater area of these provinces. Irregular weather patterns have also impacted negatively on the industry. Therefore, selecting catfish for enhanced environmental and salt tolerance is necessary to sustain catfish farming in the Mekong Delta. This research needs to be implemented by scientists and research institutes to assist farmers and reduce vulnerability and negative impacts of climate change and saline water intrusion.

Improving fingerling quality

Good fingerling quality is a key factor for successful catfish farming, especially in the face of negative climate change impacts.

Good fingerling quality is a key factor in preventing disease outbreaks and high mortality as well as maintaining production, especially in the face of adverse impacts of climate change. Hatcheries and research institutes should investigate methods to improve the quality of fingerlings to sustain the industry.

Summary of recommendations for key stakeholders

Stakeholder group	Recommendations
Department of Agriculture and Rural Development Universities Research Institutes	• Train farmers and technicians in climate change adaptation measures
Governments Animal health companies NGOs	• Develop vaccines for treatment of major catfish diseases
Research institutes Universities Hatcheries	• Identify candidate species for polyculture with catfish • Develop salinity tolerant, poor water quality tolerant catfish strains • Improve fingerling quality