

# Vulnerability and adaptation to climate change for shrimp farming in India: Policy and institutional adaptation measures

**POLICY BRIEF**

Stakeholder panel consultation meeting at Vijayawada

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## POLICY RECOMMENDATIONS

- **RECOGNISE AQUACULTURE ON PAR WITH AGRICULTURE SO THAT SHRIMP FARMERS CAN GET ACCESS TO INSTITUTIONAL CREDIT SUPPORT AND CROP INSURANCE AT THE TIME OF EXTREME CLIMATIC EVENTS AND ELECTRICITY AT LOW TARIFF:** The Department of Fisheries, together with insurance companies and commercial banks, should jointly develop measures to help shrimp farmers. Aquaculture crop insurance at a low premium, as available in the agriculture sector, will help shrimp farmers cope with damage to farm infrastructure due to extreme weather events, or loss due to disease.
- **SECURE NATIONAL CALAMITY CONTINGENCY FUND ASSISTANCE FOR SHRIMP FARMERS TO COMPENSATE FOR LOSSES DUE TO EXTREME WEATHER EVENTS:** In the existing calamity relief proforma of the Ministry of Home Affairs, Government of India, shrimp farming should also be listed for compensation, as capital investment in the sector is high.
- **IMPROVE EARLY WARNING SYSTEMS ON CYCLONES AND FLOODS:** This will help the farmers to plan in advance and prepare measures to minimise losses from the extreme weather events. Although weather forecasting is already in place, service providers should target delivery of warnings directly to farmers via SMS through mobile phones from the Indian Meteorological Department and Central Water Commission.
- **DEVELOP CONTINGENCY PLANS TO OVERCOME LOSSES FROM EXTREME WEATHER EVENTS OR CLIMATE CHANGE AFFECTING THE NORMAL CROP CALENDAR:** Efforts may be made to supply finfish seeds to the farmers to reduce their risks and vulnerability, as finfish are more tolerant to variations in water quality parameters due to climatic events and can be cultured throughout the year.
- **REPAIR FLOOD BUNDS AND IMPROVE THE QUALITY AND AVAILABILITY OF SOURCE WATERS THROUGH DREDGING AND DEEPENING OF WATER BODIES:** The Public Works Department of respective States should undertake this work to ensure that bunds are strengthened to minimise farm losses from flood and high tides. Dredging and deepening of water bodies should be carried out by the Irrigation and Drainage Department. District level planning for water budgeting is required to avoid conflicts between aquaculture and agriculture and other users.
- **STRENGTHEN COASTAL SYSTEMS AGAINST STORM SURGE AND SEA LEVEL RISE BY PLANTING TREE BARRIERS:** Afforestation programmes by the Forest Department will help to strengthen coastal system and act as shelter belts against storm surge and sea level rise.
- **BUILD CAPACITY OF FARMERS THROUGH TRAINING AND INITIATION OF A CLIMATE FIELD SCHOOL:** Training programs need to be provided in a 'learning by doing mode'. Research Institutes should focus on 'training the trainers' from the Department of Fisheries and the National Centre for Sustainable Aquaculture, and these organisations can in turn coordinate the farmers training programmes.
- **ENCOURAGE WOMEN'S PARTICIPATION IN FUTURE ADAPTATION MEASURES:** Although women already participate in day to day farming activities, it is recommended that their role should be increased, especially in implementing climate change adaptation measures. All training programmes undertaken by different departments should actively encourage the participation of women.

## SHRIMP FARMING AND CLIMATE CHANGE

This brief summarises the results from the interdisciplinary and multi stakeholder participatory study conducted within the Aquaclimate Project in Krishna District, Andhra Pradesh, India looking at the impacts of climate change on shrimp farming. The brief further provides guidelines for development of policy measures to address the climate change impacts on small scale shrimp farming.

### Significance of Shrimp Farming

Brackishwater aquaculture in India is dominated by shrimp farming and the country ranks as one of the largest producers of the shrimp in the world. Presently, shrimp aquaculture occupies around 150,000 ha, mainly on the eastern coast, and produces approximately 200,000 tonnes, most of which is exported, representing 21 per cent by volume and 44 per cent by value of Indian seafood exports in 2008-2009.

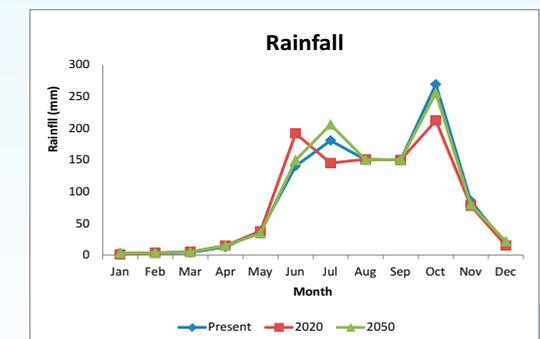
Shrimp farming has made a positive impact on the socio-economic development of rural communities, providing livelihoods for about one million poor rural people, both directly and through secondary industries. Improved incomes contribute to the food security of participants and increase their access to education, housing and purchasing capacity. Shrimp farming has also contributed to the development of rural infrastructure such as roads, electricity, communications and transportation networks, and provides a check on migration of rural people to urban centres.

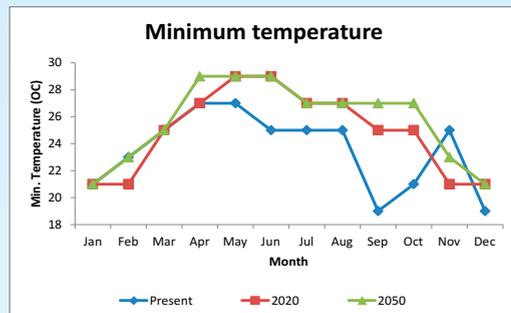
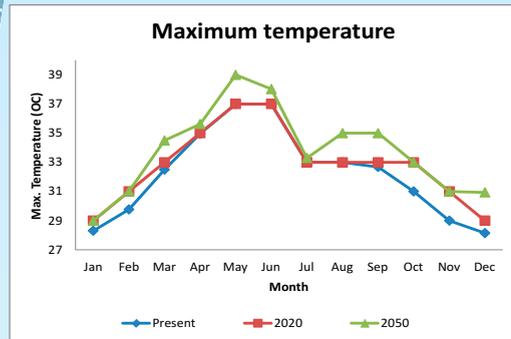
Most Indian shrimp farms are small, averaging less than 2 ha, and are constrained by infrastructure limitations including a lack of electricity in many areas. Due to the export-oriented nature of the industry, sanitary and food safety issues are important considerations.

### Impacts of Climate Change on Shrimp Farming

Climate change impacts such as fluctuations in temperature and rainfall and an increase in frequency of extreme climatic events such as floods, cyclones, drought and tidal surges have serious consequences for shrimp farming. While extremes in weather parameters can lead to losses and crop failure, extreme climatic events threaten the lives, livelihoods and farm infrastructure.

Average maximum temperature scenarios forecast in the study area suggest that temperatures will increase throughout the region. The maximum temperature will increase by 1-2°C between 2020 and 2050 and hot spells are expected to last for longer periods. The present peak average temperature, which occurs in May to June, will be extended by two and half months by 2050, which poses significant risks such as an increase in both salinity and thermal stratification, likely to cause problems with low dissolved oxygen levels in shrimp ponds and possibly increased risk of disease. There may be local variability in temperatures depending on proximity to the sea with the warming more pronounced in the coastal part of Krishna district. Since there will not be much change in rainfall, the increase in temperatures will have adverse effect on the availability of water and on water quality parameters, thus affecting the shrimp growth





performance. Forecasts for the study area indicate that the mean monthly minimum temperature will increase by 2-4°C between 2020 and 2050 relative to the present. The lowest minimum temperature is expected to be more than 2°C warmer. The increase in temperature during winter months will be positive for shrimp farming leading to better food conversion rate and faster growth rate.

By 2050, average monthly rainfall is not expected to have changed much from present levels during the months of January to May, August to September and November to December. However, average July rainfall is expected to have decreased by 2020 and to have increased by 2050, whereas an increase in rainfall compared to the present is predicted for the month of June between 2020 and 2050. Peak rainfall currently is observed in the month of October (269 mm) and is forecast to decrease between 2020 and 2050. However, the decrease in rainfall during July and October should not have any adverse effect on shrimp aquaculture for the farmers practicing zero water exchange.

The Aqua Climate 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. This brief provides a summary of the project's work with tiger shrimp farmers in the Indian case study area, Krishna District in Andhra Pradesh. It highlights the policy and institutional adaptation measures that will be required to increase the adaptation capacity of farmers and to sustain the industry and its contribution to the livelihoods of poor farmers and food security. The project was 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. The project was undertaken by international partners Bioforsk, Norway, Akvaplan-niva Norway, Kasetsart University, Thailand and local case study partners. The local partners for the tiger shrimp case study were the Central Institute of Brackishwater Aquaculture of the Indian Council of Agricultural Research, in conjunction with National Centre for Sustainable Aquaculture, affiliated with the Marine Products Export Development Authority.

## POLICY MEASURES

**Recognise aquaculture on par with agriculture so that shrimp farmers can get access to institutional credit support and crop insurance at the time of extreme climatic events and electricity at low tariff**

Many shrimp farmers do not have licenses and therefore are not in a position to obtain institutional loans, crop insurance and other government incentives. Electricity charges are high for aquaculture compared to agriculture and many shrimp farms still do not have access to electric power. Insurance available to shrimp farmers is at high premium, unlike agriculture.

Reclassification of coastal lands unsuitable for agriculture for use in aquaculture, and certifying the individual farmers by the State

Revenue Department, are immediate requirements to allow shrimp farmers to apply for license from the Coastal Aquaculture Authority. Obtaining a license will help farmers to access calamity relief, soft loans and other benefits and incentives provided by the government. Farmer-friendly insurance for aquaculture with low premium is important to help compensate for damage to farm infrastructure and loss of stock caused by extreme weather events and disease. The State Department of Fisheries together with insurance companies and commercial banks should jointly develop measures to help shrimp farmers, including soft loans on par with those available for agriculture. The State Electricity Department should provide small-scale shrimp farmers with access to electricity at low tariffs on par with agriculture. This will help to reduce the cost of production by minimising the dependency on diesel for pumping and aeration, which in turn also reduces carbon foot print.

**Secure National Calamity Contingency fund (NCCF) for shrimp farmers to compensate the losses due to extreme weather events**

In the existing calamity relief proforma of Ministry of Home Affairs, Government of India, shrimp farming is not specifically mentioned and is equated with fish ponds. Whenever extreme weather events occur, a Central team consisting of members (Ministry of Agriculture) nominated by the Government visit the affected areas and make damage assessment of different sectors.

The policy change should include making relief compensation available to shrimp farmers via listing it the calamity relief proforma. During extreme climatic events, in the damage assessments by Central team, shrimp aquaculture has not been considered till date and the Government should also consider including this sector.

**Improve early warning systems on cyclones and floods**

Cyclones and floods are the two critical climatic events perceived as threats to the shrimp farming and there is a need to provide advance warnings to farmers, to assist them to prepare and reduce losses. Although weather forecasting is already in place, farmers do not have timely access to warning information.

The Indian Meteorological Department (IMD) and the Central Water Commission should provide a micro (district) level forecasts and warnings on extreme events such as cyclones, storm surges and floods. Dispatch of early warnings directly to farmers through SMS to mobile phones should be investigated on a pilot scale by IMD. This will help the farmers to undertake mitigative measures and minimise losses.

**Develop contingency plans to overcome losses from extreme weather events or changes in climate affecting the normal crop calendar**

Alternative crops /species should be made available in case of shrimp crop failure due to extreme weather events or changes in climate such as heavy rains or high temperatures. Culturing finfish reduces the risks and vulnerability as fish are generally more tolerant of variations in water quality parameters and can be cultured throughout the year.

Finfish brood stock facilities should be established for quality seed production in shrimp growing areas and, efforts have to be made to supply finfish seed to the farmers.

**Repair flood bunds and improve the quality and availability of source waters through dredging and deepening of water bodies**

Improving flood-prevention bunds will help minimise losses and damage to farms. The quality and availability of water will be a

problem in source waters for shrimp farming due to extreme changes in weather parameters such as high temperatures and heavier rainfall at some times of year. Due to the limited availability of water, conflicts are likely to arise with other users.

Flood bunds need to be constructed in some flood prone areas and maintenance and repair of existing bunds needs to be undertaken by the Public Works Department (PWD) of respective States. In general, structures constructed by PWD to regulate water flow must be managed so as to reduce or mitigate the possibility of extreme flooding. The Irrigation and Drainage Department should carry out the dredging and deepening of water bodies to improve the availability and quality of source waters. District level planning for water budgeting is required to avoid the conflicts between aquaculture and agriculture. As there is no special policy on the supply of freshwater to aquaculture, at least in the lean seasons of agriculture, access to water should be provided for aquaculture.

**Strengthen coastal systems against storm surge and sea level rise by planting tree barriers**

Mangroves are effective in protecting shrimp farms and coastal villages from some kinds of extreme climatic events. Casuarina tree plantations on some parts of the east coast have proved to be effective barriers against storms and floods.

Afforestation programmes should be carried out by the Forest Department to strengthen coastal ecosystems and provide shelter belts against storm surge and sea level rise. Restrictions on mangrove plantations outside the reserve forest area should be liberalised for development of community based mangroves in integration with aquaculture.

**Build capacity of farmers through training and initiation of Climate Field School**

Shrimp farmers need to be trained in better farm management practices that can assist in

coping with extreme weather events. Since most farmers are of a relatively low literacy background, capacity building programmes need to be conducted in a 'learning by doing' mode and must be in local languages. Pictorial guides and posters are required to enhance understanding.

Research Institutes should focus on 'training the trainers' from the Department of Fisheries and National Centre for Sustainable Aquaculture, and these organisations can coordinate the provision of short and long term training programmes to farmers, caretakers and operators. Such training programs need to be offered in each mandal (administrative unit of district) to reach a large number of farmers. The National Fisheries Development Board should consider providing funding support to such training programmes. Additional Fishery Extension Officers are required in the Department of Fisheries to provide services to farmers. A Climate Field School concept should be initiated based on the successful model being operated in the Philippines, either by NaCSA for aquaculture, or by the government for both agriculture and aquaculture.

**Encourage greater participation of women in climate change adaptation measures**

Women already participate in day to day farming activities from the stocking to harvesting and are equally vulnerable to climate change events either directly or indirectly. In the case of extreme climatic events, crop loss and damage to infrastructure affect both the genders equally. Addressing gender issues with suitable strategies or programmes is important in improving their adaptive capacity.

It is recommended that women's role should be increased, especially in implementing climate change adaptation measures. All training programmes undertaken by any department should actively encourage greater participation by women.

**SUMMARY OF RECOMMENDATIONS FOR KEY STAKEHOLDERS**

Stakeholder group	Recommendations
Department of Fisheries National Centre for Sustainable Aquaculture Marine Products Export Development Authority National Fisheries Development Board	<ul style="list-style-type: none"> <li>Capacity building of farmers through trainings on optimum utilisation of inputs such as feed and fuel and climate change adaptation strategies.</li> <li>Improve market access for aquaculture produce during emergency harvest in case of extreme weather events and development of cold storage facilities.</li> </ul>
Ministry of Home affairs  Ministry of Agriculture	<ul style="list-style-type: none"> <li>Calamity relief fund for shrimp farmers to compensate the losses due to extreme weather events.</li> <li>Introduction of new species after quarantine risk assessment and through implementation of strict legal legislation.</li> <li>Investment in climate change research.</li> </ul>
Coastal Aquaculture Authority	<ul style="list-style-type: none"> <li>Licensing of aquaculture farms</li> </ul>
State Electricity Department	<ul style="list-style-type: none"> <li>Providing small scale farms with electricity on par with agriculture without interruption at reduced tariff.</li> </ul>
Indian Meteorological Department Central Water Commission	<ul style="list-style-type: none"> <li>Provide early warnings to farmers on cyclones and floods through mobile phones / SMS.</li> </ul>
State Public Works Department Irrigation and Drainage Department	<ul style="list-style-type: none"> <li>Construction of bunds to protect the farms from floods and minimise the losses.</li> <li>Dredging and deepening of water bodies to improve the quality and availability of source waters.</li> </ul>
Non-Government Organisations Women self-help groups	<ul style="list-style-type: none"> <li>Addressing gender issues with suitable strategies or programmes for improving their adaptive capacity.</li> <li>Afforestation, mangroves plantation.</li> </ul>
State Revenue Departments	<ul style="list-style-type: none"> <li>Reclassification of coastal lands unsuitable for agriculture for use in aquaculture, and issuing the enjoyment certificate for individuals to obtain aquaculture license from the Coastal Aquaculture Authority to facilitate access to institutional credit support and insurance.</li> </ul>

