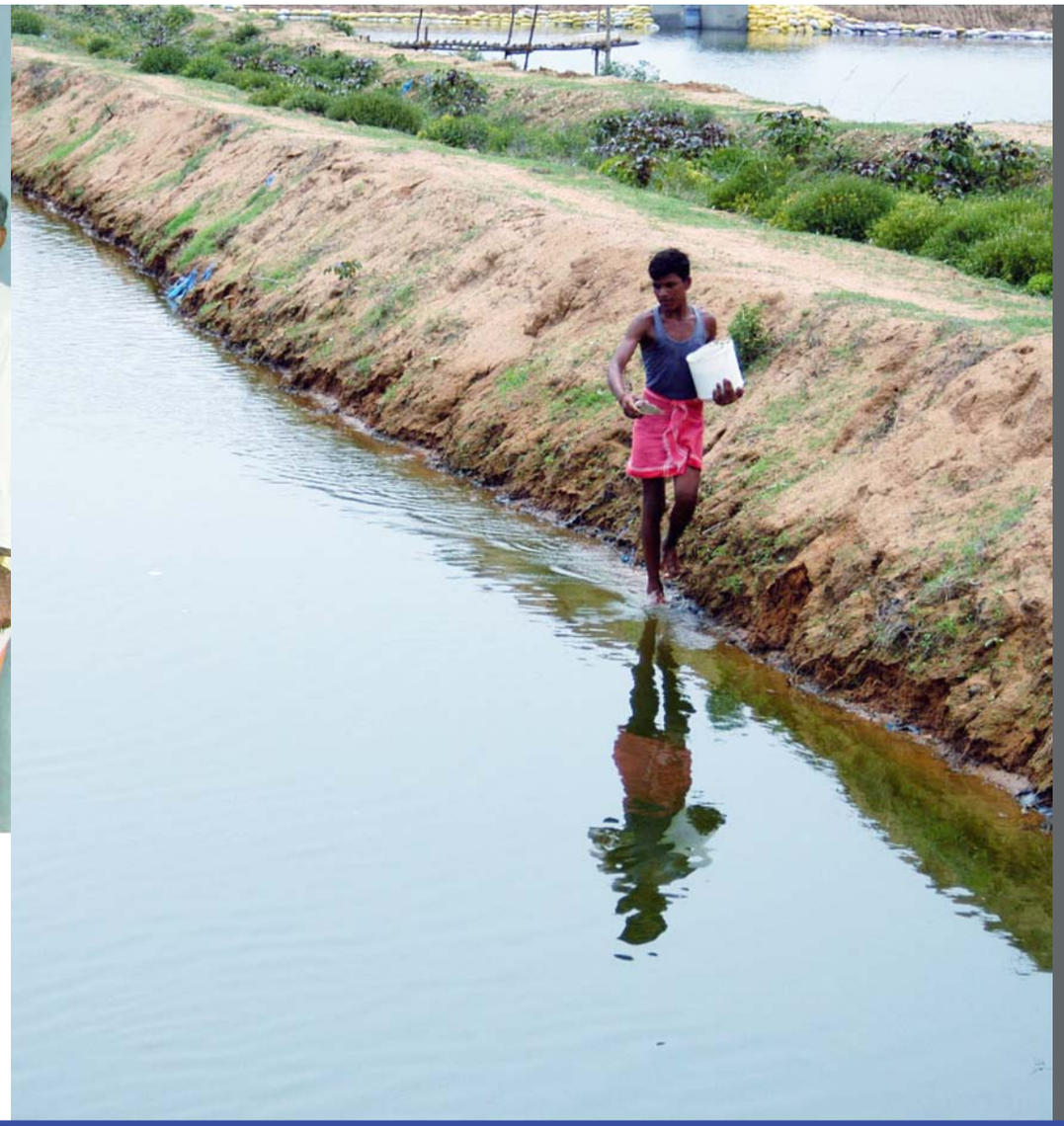
Focus Group discussion at Gullalamoda, Krinshna District, Andra Pradesh



TECHNICAL BRIEF

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Vulnerability and adaptation to climate change for shrimp farming in India: Adaptation measures for small scale shrimp farmers

Restricted circulation and subjected to revision

SHRIMP FARM ADAPTATION MEASURES

- STRENGTHEN AND INCREASE THE HEIGHT OF POND DYKES AND FARM BUNDS: Increasing the strength and height of pond dykes and perimeter bunds will help reduce damage and escape of shrimp due to cyclones, storm surges and floods. Making soft loans and incentives available to farmers, particularly after extreme weather events will facilitate this work.
- FOLLOW EXISTING BETTER MANAGEMENT PRACTICES (BMPs) FOR SHRIMP AQUACULTURE: Existing BMPs for shrimp farming can reduce the adverse impacts of climate change. Maintaining good soil and water quality and efficient feeding practices improves the health status of the shrimp, which makes them better able to cope with environmental fluctuations. Farmers should follow bio-security protocols such as installation of bird and crab fencing, pre-treatment of water with filtration and use of holding reservoirs, appropriate stocking densities and use of quality seed that has been screened for disease. Following BMPs will also help farmers to protect their production and income, so that they will be in a position to take other actions when the need arises. Scientific institutions, Department of Fisheries and National Center for Sustainable Aquaculture should popularise BMPs and support farmers in their implementation.
- USE OF ELECTRICITY FOR WATER PUMPING AND PROVIDING AERATION DURING WEATHER DISTURBANCE SITUATIONS: Farmers should replace diesel pumps and aerators with electric ones to reduce production cost and increase their technical and economic efficiency. Government should install electricity supply lines and ensure the continuous supply of electricity to farmers at low tariff.
- MAINTENANCE OF BUFFER ZONE BETWEEN THE FARMS AND WATER SOURCE FOR PROTECTION TO FARMS AGAINST CYCLONES AND STORM SURGES: Planting mangroves in buffer zones can help protect farms from floods, storm surge and other extreme weather events.
- COLLECTIVE PLANNING BY THE FARMERS GROUP TO MITIGATE THE IMPACTS OF CLIMATE CHANGE: Collective planning by groups of farmers can improve crop performance, save money on purchase of inputs and negotiate a better market price. Farmers should consider forming a group or society with neighbours to coordinate their farming activities through development of a common crop calendar, to share information and to reduce disease risk and ensure good profits. The Department of Fisheries and the National Centre for Sustainable Aquaculture should assist local farmer groups to establish societies.

Focus Group Discussion at Chinnapuram, Krishna District, Andhra Pradesh

SHRIMP FARMING AND CLIMATE CHANGE

This technical 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 and adaptation measures in the shrimp farming sector. The brief further provides guidelines for adaptation measure that can be undertaken by the farmers together with the institutional, policy and science and technology support for improving their adaptive capacity to cope with future climate change.

Significance of shrimp farming

Andhra Pradesh state contributes more than half of India's shrimp production and has been in the forefront since the beginning. The quality of water in respect of year-round salinity distribution, the chemical and physical characteristics of the soil and the availability of seed in the state are favorable for coastal shrimp aquaculture. The culture systems adopted in Andhra Pradesh vary greatly depending on the inputs available in any particular region as well as on the investment capabilities of individual farmers.

The shrimp aquaculture industry in India has witnessed several important changes over the last two decades. On the east coast of India. Shrimp farming was seriously affected by white spot syndrome virus disease since 1993, leading to a rapid decrease in the farming area and production volume. From 1999, falling market prices have continued to have serious impacts on shrimp exports causing income losses to farmers in the region.

Ninety four percent of the total developed area for shrimp farming (representing 93.4% of farmers) in Andhra Pradesh State is of holdings less than 2 hectares in size. Scientific shrimp farming generates a maximum of around 650 person-days per hectare per annum.

Impacts of climate change on shrimp farming

The Andhra Pradesh coast is known for its frequent tropical cyclones and tidal surges causing loss of life and property in the region. The segment of Andhra Pradesh coast between Ongole and Machilipatnam is most vulnerable to high storm surges which are a regular feature in the Bay of Bengal. In this century alone, the state has been pounded by 18 devastating storms causing enormous loss of life and property.

Shrimp farmers consulted in the Aquaclimate Project generally expressed that climate change is a serious threat and needs to be addressed in an integrated manner. An expansive survey of 300 farmers indicated that cyclones and floods were perceived as serious threats by all the farmers, while heavy rain (91%), high temperature (89%), irregular season (79%), and drought (59%) were also seen as threats by farmers. Cyclones, floods, high temperatures, heavy rain and irregular season are in order the most serious weather-related problems at present. In future, farmers expect high temperatures, floods, heavy rains and cyclones to be the main problems.

The seasonal changes observed by farmers are mainly temperature variations and delay in monsoon. Cyclones are an infrequent but potentially serious problem. If a cyclone occurs with heavy rainfall, then the economic loss can be 100 per cent.

Seasonal variations in general had effect on shrimp molting, growth and production. An income loss of 100% could occur if these variations are observed at 40 days of culture, 50% loss at 80 days of culture and 10% loss at 120 days of culture. Heavy rainfall is also associated with disease outbreak, infrastructure damage and leads to high unit production cost of shrimp. An income loss of 70% could occur in the summer crop if heavy rainfall is predicted after 80 days of culture, and extra investment is required for repairing dykes and ponds and electricity charges. High temperatures favour culture up to some extent but excessive temperatures lead to slow growth rates, an increase in culture period and cost of production and reduced market. Flood causes submergence of ponds, breach of pond dykes and sluice gates, escape of shrimp (100% stock escape from ponds nearer to water source), higher incidence of diseases and production loss of 70-100%. Cyclones caused loss of farm infrastructure, damage to electricity lines and power failure. Cyclone associated with heavy rainfall leads to flooding, escape of shrimp and contamination across ponds.

The summer season is from March to June with more temperatures in April and May. The temperatures registered in summer are very high and during 2007 reached 50°C. The winter season is from November to February and the coldest temperatures occur in December and January. The wet season is from June to September with more rain in July and August months. The occurrence of floods, cyclones and high tides are of unusual in the months of May and November. Crop activities such as pond preparation including repair of pond dykes, intake and sluice structures, draining and drying of ponds are undertaken in the dry months January and February for the first crop and in May and June for the second crop. During this time the weather is dry and allows the pond bottom to dry faster. Water filling and bloom development is during February and March for the first crop and July to August/September for the second crop. The harvesting time spreads over May and June for the first crop and November to December for the second crop. Diseases are more common during the monsoon and post monsoon period.

Farming experience and membership in farmer societies were found to have a significant influence in improving the technical and economic efficiencies of farms and offer the potential to help mitigate adverse climate change impacts.

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. 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 adaptation measures to be undertaken by farmers to sustain the industry. 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.

SHRIMP FARM ADAPTATION MEASURES

Strengthen and increase the height of pond dykes and farm bunds

Many small-scale farmers do not have farm bunds owing to the small size of their properties and in many cases the bund is not high enough to prevent damage by cyclones and storm surge. Pond dykes should be strengthened every year to compensate for erosion by water currents in the pond, and damage due to rain.

It is necessary to strengthen the individual pond dykes, especially in areas prone to cyclones and flooding to prevent the escape of shrimp. Placing netting around the pond and strengthening the bund with sand bags are low investment, long term solutions compared to high cost of lining the bund with HDP polythene. Farmers can undertake this work by themselves but they should be provided with easy access to soft loans or incentives, particularly after extreme weather events when renovation is necessary. The calamity relief compensation fund should be made available at the earliest to attend the renovation works.

Follow existing better management practices for shrimp aquaculture

Water quality in culture ponds changes due to seasonal variations and sudden shifts in weather parameters such as heavy rains or hot dry weather resulting in flood and drought. Feed intake by animals will decrease when the weather is hot or cloudy. In these situations, farmers should implement better management practices (BMPs) recommended to maintain water quality and shrimp health. This will protect the crop and income of the farmer and maintain their capacity to cope with climate change impacts.

Due to seasonal variations in weather parameters, regular water quality and shrimp health monitoring helps to maintain the optimum parameters in the pond environment, while optimum feed management helps to avoid wastage and reduce production cost. BMPs are actions that can be taken directly by farmers, most efficiently as part of collectives, such as use of quality seed pre-screened for major diseases, pond preparation and stocking practices, and simple biosecurity and disease control measures. BMPs improve the profit and financial security of farmers, increasing their capacity to make further investments in climate change adaptation measures. Farmers require support and advice on implementing BMPs from scientific institutions. The Department of Fisheries, Marine Products Export Development Authority and National Center for Sustainable Aquaculture should make all the other logistics to implement the adaptation measures.

Use of electricity for water pumping and providing aeration during weather disturbance situations

Farmers need to pump water regularly during hot weather to maintain water levels and operate aerators during cloudy days. As many farms are not electrified, expenditure and energy consumption with the use of diesel are high.

Replacing diesel pumps and aerators with electricity will help farmers to decrease production cost and increases their technical and economic efficiency. It also helps in decreasing the contribution of shrimp aquaculture towards global warming potential (reducing carbon foot print). Government should take initiative to install electricity supply lines and ensure the continuous supply of electricity to shrimp farmers at lower tariffs equivalent to those of agriculture.

Maintenance of mangrove buffer zone between farms and to protect against cyclones and storm surges

Mangrove planting to form a buffer zone or shelter belt can help protect farms from flood, storm surge and other extreme weather events. The availability of land and actual implementation can be a problem, particularly for small-scale farms that cannot afford to spare land for non-production purposes.

Government should designate buffer zones between farms and the main water source, and encourage farmer cooperatives to plant mangroves in the buffer to provide protection.

Collective planning by the farmers group to mitigate the impacts of climate change

Collective cooperation and planning is required among the farmers to ensure sustainable shrimp farming and to cope with climate change impacts. As a member of a society or association, farmers can benefit from participation in crop calendar meetings and through sharing information on the incidence and management of disease to help improve their crop and profit.

Farmer collectives should coordinate their activities through meetings and the development of a common crop calendar for management of stocking, harvesting, purchase of inputs and sales. Such associations increase the market power of farmers, assisting them to negotiate favourable terms with suppliers and buyers, to obtain access to loans and insurance, and to establish common infrastructure such as reservoirs, settlement ponds and mangrove buffer zones. The Department of Fisheries and National Centre for Sustainable Aquaculture should assist farmers to establish societies for collective action.

SUMMARY OF RECOMMENDATIONS FOR KEY STAKEHOLDERS

Stakeholder group	Recommendations
Farmers	• Undertake pond dyke strengthening & increase height of farm bunds • Use electricity for aeration and pumping • Implementation of better management practices to reduce or mitigate climate change impacts on production • Collective planning of farming activities
Government sector	• Establish calamity relief compensation fund for shrimp farmers • Establish access to electricity at low tariff on par with agriculture
Research Institutions	• Develop scientific solutions and adaptation measures to address predicted climate change impacts
Private sector (Insurance companies and Commercial Banks)	• Facilitate soft loans for small scale farmers • Provide crop insurance policies for shrimp farmers