Waterlogging: a huge challenge for people in Malda district

This demonstration project was realised under the Indo-German development project Climate Change Adaptation in Rural Areas of India (CCA RAI) which is jointly implemented by the Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. CCA RAI is financed by the German Federal Ministry for Economic Cooperation and Development. For further information see: www.ccarai.org

Livelihood diversification through Integrated Production Systems

Project location	7 villages in the districts of Murshidabad and Malda, West Bengal
Project duration	October 2011 – August 2013
Local implementation partner	Development Research Communication & Service Centre (DRCSC)
Project costs	2,055,397 Indian Rupees equalling 25,375 Euro
Geographic features	Floodplains of the river Ganges, waterlogged for six months of the year
Climatic stresses	Shifting rainfall patterns, erratic rainfall affecting waterlogging conditions, increase in temperature
Non-climatic stresses	River bank erosion, high degree of poverty with 34 per cent of the population living below the poverty line of 1.25 US Dollar per day, increasing costs for agricultural production, lack of arable land
Predominant livelihood sources	Rain-fed agriculture (paddy, jute, wheat and potato cultivation) on land holdings ranging from 2 to 4 hectares
Project beneficiaries	158 individuals

DRCSC
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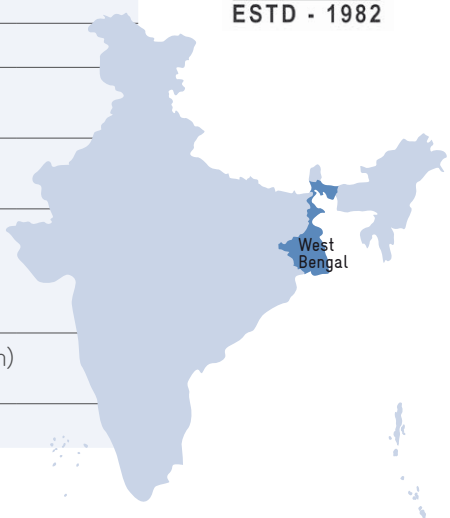

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Ministry of Environment, Forests and Climate Change, Government of India

Project context and need for adaptation

West Bengal is flood prone, mainly due to heavy precipitation during the summer monsoon. Between 1960 and 2000 the state had only five flood-free years. Murshidabad and Malda are among the districts in the Ganges basin of West Bengal that are affected most by flooding. Rain-fed agriculture remains the primary source of income, but due to changes in precipitation patterns and temperature the yields of paddy, jute, wheat and potato have gone down in the last years. Especially paddy and jute production are affected by an increased duration of waterlogging. The Jute harvest, for example, has suffered greatly in recent years from the early onset of the summer monsoon. Heavy rains leading to waterlogging now start already in July whereas before 1990 they usually did not start until August, the month of the jute harvest. Thus, the growth of jute plants is hampered by stagnant water. In contrast, the production of wheat and potato, which are the major winter crops, mainly suffer from decreasing rainfall and higher winter temperatures. Another severe challenge is riverbank erosion which causes loss of land and has already forced some farmers to move. This, combined with reduced crop yields and cattle loss, has resulted in socio-economic problems including debt and migration.

The project enabled communities to adapt to climatic variability by changing the way they make use of their land and by introducing more sustainable and diverse farming systems. Sujit Mitra from the Development Research Communication & Service Centre (DRCSC) explains that *integrated production* means a more integrated approach to farming as compared to existing methods. It basically combines farming with livestock: "An Integrated production system is an improved version of mixed cropping that utilises not only crops but different types of plants, livestock and poultry, fish and other aquatic flora and fauna like molluscs and worms. These are combined in a way that each element helps the other. This approach enhances the overall production both in terms of quantity and quality, diversifies income sources and thereby reduces the overall risk."

Adaptation hypothesis

Adjusting cropping patterns, introducing new cultivation methods and establishing integrated production systems by incorporating different agricultural subsystems such as crop cultivation, livestock breeding, poultry and fisheries increase the livelihood base of farmers. This, in turn, reduces their vulnerability to climatic variability and makes them more resilient in the event of climatic extremes.

Sayra Bibi in her vegetable garden

Sayra Bibi, 36 years
Balarampur village, West Bengal

"I used to buy all my vegetables on the market. Today, I have my own garden. I have started to plant crops like Sesbania grandiflora, Indian coal tree, and pigeon pea which can stand drought and excess water. This made my water-inundated fallow land productive again. I also learned how to use the leaves and twigs of these trees and plants for fodder and fuel, for the preparation of green manure and for the construction of trellis. Another thing I have learned is how to use the cow-dung and left-over waste materials from the house for preparing vermicompost which is used in my garden as organic fertiliser.
My income opportunities have increased immensely. Last year, I could make 3,066 Rupees by selling vegetables – after meeting my own family's nutrition requirement. I could earn 1,410 Rupees by selling vermicompost, 135 Rupees by selling eggs and 1,800 Rupees by selling fish that I started cultivating in ponds that we dug in my garden. It's the first time in my life that I feel like I have things in my own hands and that I am not as vulnerable and at mercy of nature as I used to be."

›› To better understand Sayra Bibi's integrated production system see sketch on page 4

A newly introduced method: floating cultivation

Adaptation interventions

- Establishment of **integrated production systems** by adding livestock, poultry, nutrition gardens and fisheries to traditional crop cultivation
- Introduction of **new crop varieties**: For example, *Sesbania grandiflora,* also known as the hummingbird tree or scarlet wisteria, was introduced as an alternative to jute; it can survive water levels up to 4.3 metres
- Mixing of **different crop varieties** throughout the year in order to diversify the agricultural portfolio and to increase productivity
- Changing the **timing of farm operations**, e.g. early sowing of crops so that famers are prepared for the early onset of the monsoon
- Introduction of **new cultivation methods**, e.g. raised beds to avoid losses due to waterlogging, floating cultivation for waterlogged areas and landless farmers or trellis cultivation for reducing damage due to hailstorm and other heavy precipitation events
- **Trainings and skill development** of farmers, e.g. on integrated farming and seed conservation, to reduce market dependency for agricultural inputs

Benefits and added value for adaptation

- **Integrated production systems**: Where crop cultivation has been diversified and complemented by livestock breeding, poultry, nutrition gardens and fisheries, incomes of beneficiaries have risen by 70–100 per cent as compared to the time before project intervention when most of the land was left fallow. The increase and diversification in income sources reduces market dependency for basic nutrition and thus ensures food security. Furthermore, it reduces the overall risk and makes the farming system climate resilient. Integrated production systems can be considered as a no-regret-option since they trigger development regardless of climate change
- **New crop varieties, changed timing of farm operations** and **mixed cropping** have led to additional income and have hence improved adaptive capacities
- **New cultivation methods** have led to additional income for beneficiaries and have thus contributed to reducing the sensitivity to waterlogging
- Overall, the multiple project interventions have contributed to **debt reduction** of the farmers and to shortening of the average **migration** period from six months to four months per year

Cost estimates* for main interventions (in INR / EUR)

*81 INR = 1 EUR

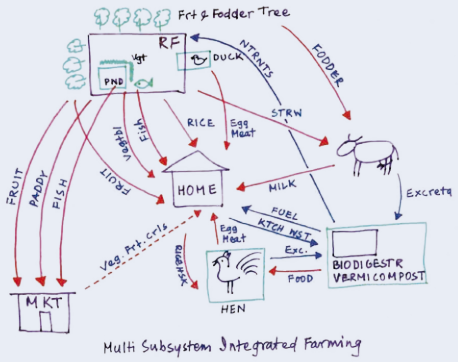
New variety *Sesbania grandiflora* – seeds and labour (per hectare)	17,500 INR / 216 EUR
Mixed cropping (per hectare)	14,826 INR / 183 EUR (per year)
New cultivation method: raised beds (per hectare)	74,749 INR / 923 EUR + 44,849 INR / 554 EUR for maintenance (every 6 months)
New cultivation method: floating cultivation (per floating bed)	1,300 INR / 16.1 EUR + 20 INR / 0.25 EUR recurring costs (every 6 months)
New cultivation method: trellis cultivation (per trellis)	550 INR / 6.8 EUR + 8 INR / 0.10 EUR recurring costs (every 6 months)

Villagers assessing climate vulnerabilties in Malda district

Success factors

- A **vulnerability assessment** helped to identify climate risks for affected farmers and allowed to plan suitable project interventions
- Local **self-help groups** that save up money and seeds were formed in the beginning of the project to make sure that interventions that require external resources can be carried out successfully by the farmers themselves and without support from outside once the project ends
- **Training and skill development** of farmers through agricultural experts have contributed to the sustainability of project interventions
- **Project experiences** were documented with the aim to improve the project's implementation – this participatory review process is called *systematisation* by GIZ

Sketch of an integrated production system



This sketch of an integrated production system for one household was drawn during a training for beneficiaries that was carried out by DRCSC.

Recommendations for project replication in the Indian context

The concept of integrated productions systems is highly relevant for poor rural communities across India. It has the potential to help communities diversify their livelihoods and thereby reduce their risks of being negatively impacted by climate variability and extreme weather events. However, the new production systems have to be adapted according to the local circumstances. Informing farmers in vulnerable areas about existing government support programmes (e.g. subsidies or direct financial support) and establishing linkages with government bodies is important for any replication on a larger scale.

As per India's Second National Communication to the United Nations Framework Convention on Climate Change, the severity of flooding is expected to increase in many Indian river basins. The average annual crop area affected by floods in India is 3.57 million hectares. Thus, the use of *Sesbania grandiflora* and deep water paddy as well as innovative ways of cultivation like floating or trellis can help vulnerable communities to adapt to climate change impacts.

Further information

Department of Environment
Government of West Bengal
www.enviswb.gov.in

Development Research Communication & Service Centre (DRCSC)
www.drcsc.org

Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
Natural Resources Management Programme
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Published: July 2014
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