

2021-2022

Restoring Farming Livelihoods in the Sundarbans

Supporting Agricultural Communities in Sundarbans Post-Cyclone Yaas



An Initiative By- SEED (Society for socio economic & ecological development)



Supported By: CSR of T & I Global Ltd.



Executive Summary

The Sundarbans region of India, a deltaic landscape in coastal West Bengal, has faced repeated cyclones especially cyclone Amphan (2020) and Yass (2021) that severely jeopardize agricultural livelihoods. By 2021, much of the farmland had become saline from storm surges, rendering traditional paddy varieties unproductive and pushing farming communities into crisis.

In response, the SEED (Society for Socio Economic and Ecological Development) launched a climate-resilient agriculture initiative in 2021–2022 post cyclone Yaas to restore farming livelihoods in cyclone-affected areas. This initiative introduced salt-tolerant paddy seeds and established community-run seed banks to enable farmers to grow crops again on salinity-stricken soils. Farmers were trained in sustainable techniques to improve yields under harsh soil conditions. Partnerships with the government's Rice Research Institute, Panchayats and CBOs underpinned the program, providing scientific support and community buy-in.

The results have been promising and quantifiable. Over 550 smallholder farmers in the Sundarbans (Patharpratima block) received hands on training on salt-tolerant paddy seeds, leading to a ~45% reduction in crop losses due to soil salinity and flooding. In 10 villages, cyclone-resilient seed banks now ensure year-round access to quality seeds, strengthening seed security for the community. Even after a saline flood, farmers have been able to harvest enough paddy for both consumption and sale, reflecting a dramatic improvement in food security.

The initiative especially targeted 300 women farmers and local self-help groups –by helping cyclone-affected families regain their primary livelihood in a sustainable, resilient manner, the project exemplifies how post-disaster interventions can build back better. This report provides a detailed overview of the initiative, its context, methodology, outcomes, and lessons learned, demonstrating an impact-oriented approach suitable for livelihood restoration post cyclones in coastal regions of India.

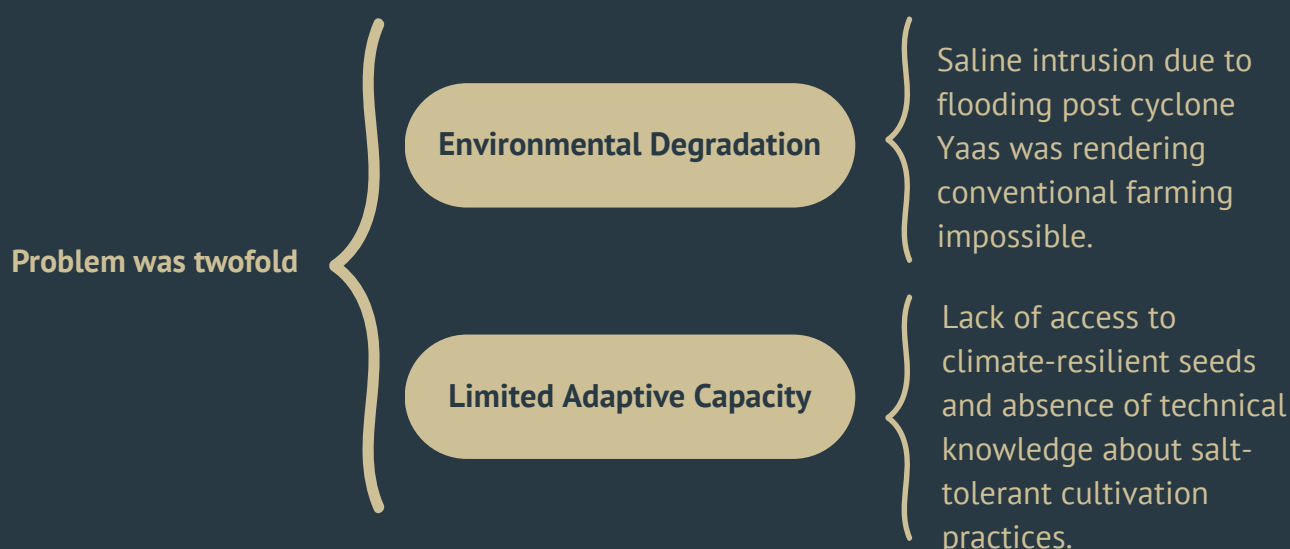
The project represents a comprehensive response to the agricultural devastation caused by Cyclone Yaas in the Sundarbans region. This initiative demonstrates how community-driven solutions can effectively address the intersection of disaster impacts and livelihood security. Through innovative approaches involving salt-tolerant seed development and climate-resilient seed banking, the project has created sustainable pathways for agricultural recovery while building long-term resilience against future climate disasters. The project's core philosophy of "Community Participation for Community Benefit" has enabled the restoration of agricultural livelihoods for over 1,200 farmers across multiple blocks, while simultaneously establishing institutional mechanisms for future disaster preparedness through community seed banks.

PROJECT BACKGROUND AND CONTEXT

Frequent and intense cyclones have devastated the Sundarbans, eroding not only the land but the very basis of subsistence for local communities. The region – an ecologically fragile network of islands and mangroves – has seen a sharp increase in extreme weather events. The Bay of Bengal's surface temperature is rising by about 0.12°C per decade, contributing to more frequent, intense cyclones that strike before communities can recover from the last events. *Disasters such as Cyclone Aila (2009), Cyclone Amphan (2020), and Cyclone Yaas (2021) have repeatedly inundated the islands with seawater. Each major storm breaches embankments and floods fields with saltwater, leaving farmlands infertile for years under layers of saline silt.*

The scale of agricultural loss has been staggering – for instance, *Cyclones Amphan and Yaas together destroyed roughly 70% of standing crops in the Sundarbans, plunging thousands of families into food insecurity.* These environmental shocks compound an already precarious situation. *Over 40% of arable land in the Indian Sundarbans is now affected by salinity, drastically reducing crop yields. Traditional high-yield rice varieties cannot tolerate the saline soil and are failing; consequently, farmers have experienced a 30–40% decline in agricultural income in recent years.* With their paddy fields ruined, many smallholders have been forced into debt or to abandon farming. Some turned to irregular daily wage labor, while a significant number of villagers – an estimated 60% of the male workforce – migrated to cities in search of work. The timing of the cyclone Yaas, coinciding with the pre-monsoon agricultural season, meant that farmers lost not only their standing crops but also their ability to plant for the subsequent growing season.

The pressing need- To restore agricultural productivity on salt-affected land and break the cycle of disaster-induced poverty by building resilience into the farming system.



Geographic Context and Community Profile

Coverage: *Pathar Pratima Block (Hingalganj, Dulduli & Sahebkhali Gram Panchayats), Sundarbans, West Bengal*

Duration: *July 2021 – June 2022*

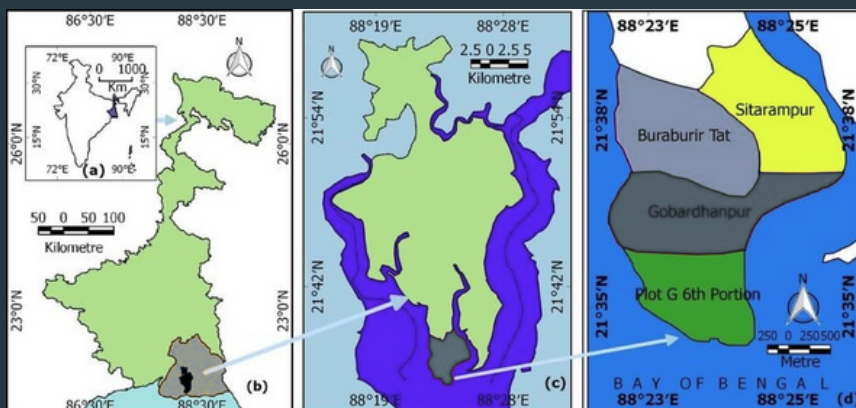
Beneficiaries: *1,200 smallholder farmers*

Patharpratima block in the Indian Sundarbans represents one of the most cyclone-vulnerable areas in West Bengal, with research studies identifying it as “cyclone-ravaged”. The region comes under the Very High Damage Risk Zone-B ($V_b=50\text{m/s}$) as per the Wind and Cyclone Vulnerability Map of India. As per the Flood Hazard Map of India, this region comes under the probable maximum surge height of 12 to 13 m.

Recent devastating cyclones including Amphan (2020), Yaas (2021) and Bulbul (2019) have repeatedly battered the region and the geography – riverine islands separated by tidal channels – makes communities here physically isolated and extremely exposed to storm surges and tidal flooding.

Most families are smallholder farmers or fishers living at subsistence level. Over half the population depends on climate-sensitive agriculture as their primary livelihood, mostly paddy cultivation on tiny plots of lands. With limited livelihood diversification and few local industries, any shock to farming or fishing reverberates through every household. Education and infrastructure are limited; for example, many villages lack robust embankments or irrigation systems and electricity and road connectivity are often sparse. Poverty rates are high, and access to credit or insurance is minimal, which means people have few buffers when disasters strike.

The cumulative effect of repeated cyclonic disasters has created a crisis of agricultural sustainability in Patharpratima block, where landowners and possessors are unable to continue farming due to permanent soil salinization and land loss. The farming communities in Patharpratima face not only immediate crop losses but also long-term challenges in restoring agricultural productivity on salt-contaminated lands, necessitating innovative interventions like salt-tolerant varieties and climate-resilient farming practices to sustain their livelihoods.



Needs Assessment

The needs boiled down to: (1) access to salt-tolerant paddy seeds (2) training and capacity building in salt tolerant cropping (3) community seed banks for long term cyclone resilience (4) institutional support and partnerships to provide technical guidance and ensure sustainability.

A comprehensive needs assessment conducted by SEED highlighted the critical requirements for livelihood restoration in the cyclone-affected Patharpratima. The primary need was agricultural adaptation to high salinity. Field surveys and soil tests confirmed that salinity levels in many paddy fields exceeded the tolerance of regular rice strains, explaining consecutive crop failures after cyclones. Farmers expressed an urgent need for salt-tolerant paddy varieties that could germinate and yield rice in brackish soil conditions. In focus group discussions, elder farmers recalled that some traditional rice landraces had higher salt tolerance, suggesting that reintroducing or developing resilient varieties was feasible. Thus, securing salt-tolerant seed stock became a top priority.

Knowledge and capacity gaps were another major area of need. The needs assessment found low awareness of techniques like soil salinity management and organic soil amendment that could improve productivity on marginal lands.

Additionally, the community identified the need for seed security and distribution systems. After each cyclone or flood, many farming households lost their saved seeds either to water damage or because they were consumed in desperation. There was no formal mechanism to ensure farmers had quality seeds to re-sow in the next season, especially climate-resilient varieties. The concept of a local seed bank emerged as a solution – a community-managed reserve of hardy seeds that could be accessed after disasters or at each planting season. Such seed banks would need external support initially (to stock improved seed varieties) and training on management and storage.



Lastly, the assessment highlighted livelihood diversification as a need, though within this project's scope the focus remained on farming. With over-reliance on a single paddy crop, any failure meant zero income. Introducing saline-tolerant vegetables or alternate crops for kitchen gardens was identified as a supplementary need to improve nutrition and income.

Addressing these needs formed the backbone of the project strategy, directly targeting the restoration of livelihoods in a sustainable, disaster-resilient manner.

The baseline situation by 2020–21 was dire: vast stretches of once-fertile land lay fallow due to salt deposition, and community food security was in peril. Yet, the community's resilience and willingness to adapt remained an asset. Local village councils (Gram Panchayats) and self-help groups were keen to collaborate on solutions to reclaim their livelihoods. In this context, any initiative to restore farming had to be community-driven, culturally appropriate, and sensitive to the challenging geography of the Sundarbans.



Goals/Objectives

The initiative's goal and objectives were formulated to directly respond to the identified needs and align with broader disaster resilience outcomes.

The primary objective of SEED's 2021–2022 agricultural restoration project was to enhance the adaptive capacity of smallholder farmers in saline-prone coastal areas of the Patharpratima through salt-tolerant cropping systems and localized seed banks.

Specific objectives:

- Promote salt-tolerant paddy varieties among farming communities in cyclone-affected blocks, enabling farmers to cultivate rice successfully on salt-inundated lands. By doing so, restore a reliable source of food and income for affected households.
- Establish 3 community-based climate-resilient seed banks in targeted villages to ensure year-round access to quality seeds to 1200 farmers and preserve salt-tolerant germplasm. These seed banks aim to reduce dependency on external seed supply, provide a safety net after disasters and encourage farmer-to-farmer seed sharing.
- Build capacity for sustainable farming practices by training at least 550 farmers (with emphasis on women farmers' participation by involving 300) in salt tolerant cropping and adaptive techniques.
- Reduce disaster-induced crop loss and enhance food security by implementing the above measures. A target was set to reduce crop yield losses due to salinity and flooding by at least 50% compared to previous cyclone impacts and to improve household food availability through better harvests.
- Foster community leadership and partnerships in resilience building by involving local institutions (45 self-help groups, 3 gram panchayats and 2 CBOs) in project planning and implementation.

Collectively, these objectives align the project with a “build back better” philosophy. Not only is the aim to bring back pre-disaster levels of agricultural production, but also to introduce improvements that make the community more resilient to future climate shocks.

Targeted Beneficiaries

Direct Beneficiaries

The project directly impacted 1,200 farmers across Pathar Pratima Block, providing them with access to salt-tolerant paddy saplings that enabled immediate resumption of agricultural activities. Each farmer received sufficient saplings to cultivate their available land, with technical support for proper transplantation and crop management.

550 farmers including 300 women farmers underwent capacity building training on salt tolerant cropping.

Indirect Beneficiaries

The project's impact extended beyond direct beneficiaries to include agricultural laborers, local input suppliers and processing units. Agricultural laborers found employment opportunities in the expanded cultivation areas, while local markets benefited from increased agricultural production.

The seed banks created long-term benefits for entire village communities, ensuring future access to climate-resilient varieties without depending on external support. This institutional innovation has the potential to serve 3,500 farmers over multiple agricultural seasons.



IMPLEMENTATION STRATEGY

From inception, SEED recognized that restoring livelihoods in a disaster-prone setting required deep engagement with the community and collaboration with institutional partners.

1

Local & Institutional Partnership

Government Partnerships- A notable strength of the project was its partnership with government agencies and experts, which lent technical credibility and facilitated resource support. The *Rice Research Institute, Government of West Bengal* was a key partner, providing the scientifically tested salt-tolerant rice varieties and technical guidance. This collaboration ensured that the seeds distributed were suited to local conditions and had undergone proper trials. Government agronomists also occasionally joined SEED's field team to observe progress and advise farmers. Local government bodies, especially the *Gram Panchayats (Hingalgang GP, Dulduli GP, Sahebkhali GP)* and *block development offices*, were kept in the loop of project activities.

Local Level Partnerships- A CBO called Society for Durbachati Social Action & Transformation, provided local implementation support and community mobilization. Another CBO- Paschim Sridharkathi led seed bank establishment in Hingalganj. Various Local Farmer Groups ensured community participation and ownership.

2

Community Participation

Early on, SEED identified local influencers – such as experienced farmers, members of existing Self-Help Groups (SHGs) and village elders – and involved them in planning. These community members helped in selecting the trial plots for the new seed varieties and in mobilizing others to attend training sessions. As the project progressed, farmers who achieved good yields became the agents of change. They shared their experiences at village meetings and even informally advised their neighbors on best practices, creating a ripple effect of knowledge transfer.

The establishment of village seed bank committees further institutionalized community participation – these committees manage the seed banks, decide on rules for seed lending/borrowing and ensure that stocks are maintained. Women's participation was also encouraged, particularly in the seed banks maintenance and capacity building training sessions on salt tolerant cropping.

Activities and Methodology

The methodology, in essence, was adaptive and participatory. It combined scientific expertise with local knowledge, started with small-scale trials, and scaled up through community enthusiasm and evidence of success. By late 2022, the integrated approach of providing resilient seeds, training and establishing seed banks had laid the groundwork for a sustainable revival of agriculture in the targeted cyclone affected Patharpratima block.

1. Community Seed Bed Development

The establishment of five community seed beds represented the project's most innovative intervention. These seed beds were strategically located in areas with access to fresh water, ensuring optimal growing conditions for salt-tolerant paddy varieties. Each seed bed was designed to produce sufficient saplings to meet the needs of approximately 550 farmers, creating a decentralized production system that reduced transportation costs and ensured timely availability.

The seed beds utilized improved varieties specifically selected for their salt tolerance and climate resilience. SEED collaborated with the Rice Research Institute (Government of West Bengal) to source a range of salt-tolerant paddy seed varieties suited for the Sundarbans' soil conditions such as Luna Barial, Luna Subarna, BINA Dhan-8, BINA Dhan-10, Jarva and others known for salinity tolerance were identified and procured. Technical support was provided by agricultural experts from IIT Kharagpur to ensure proper seed treatment, nursery management and sapling development. Community volunteers were trained in nursery management techniques, creating local capacity for future seed bed operations.

The seed bed sites were chosen through community consultations, ensuring accessibility for farmers from different villages. SEED ensured that at least one demonstration plot was set up in each target village, which served as a local example and learning site for others.





2. Climate-Resilient Seed Bank Establishment

A cornerstone of the methodology was setting up of 3 climate-resilient seed banks in the community. By mid-2022, SEED established seed banks in each of the targeted GPs. Each seed bank was essentially a secure storage facility managed by a local committee (composed of members of women's self-help groups and farmer cooperatives).

The seed banks were initially stocked with surplus salt-tolerant paddy seeds from the first successful harvests and with additional foundation seed provided by the Rice Research Institute. SEED provided training on seed preservation techniques – such as sun-drying seeds to the right moisture content, using airtight containers and organic pest deterrents (neem leaves, etc.) to avoid storage losses. The community committees set up guidelines for seed bank operation, which typically involve women farmers. This system ensures year-round access to quality seeds and creates a communal buffer stock to be used especially after climate disasters.

3. Farmer Capacity Building Program

A comprehensive capacity building program was implemented to ensure that farmers could effectively utilize salt-tolerant varieties and adopt climate-resilient practices. These trainings were often conducted with support from agricultural scientists. For instance, experts from IIT Kharagpur such as Dr. Asok Kumar Karan were roped in to lead sessions. The program included theoretical sessions on climate change impacts, practical training on salt-tolerant cultivation, and demonstration plots showing best practices.

Training modules covered soil management in saline conditions, water management techniques, integrated pest management and post-harvest processing. Special emphasis was placed on indigenous knowledge integration, combining traditional farming wisdom with modern climate-resilient practices.

The program also included exposure visits to successful climate-resilient farming initiatives in other regions, enabling farmers to learn from peer experiences and adapt successful practices to local conditions.

4. On-farm Support and Monitoring

SEED's field officers and agronomists provided continuous on-farm support throughout the crop cycle. They conducted regular visits to monitor paddy growth, soil condition and to advise on issues such as pest attacks or nutrient deficiencies.

This hands-on approach was critical, especially in the early adoption phase, to ensure that farmers applied the training correctly and that any challenges with the new seed varieties were promptly addressed. The project team also collected data on crop performance – yield per hectare, losses, grain quality – to evaluate impact. Local government agriculture extension workers were invited to join some of these visits, fostering collaboration. In several instances, village Pradhan participated in field days.



5. Community Mobilization and Awareness

SEED placed a strong emphasis on community participation at every stage. Village meetings and awareness campaigns were held to explain the project's purpose and build trust in the new seeds. This involved sharing success stories of farmers who had managed to harvest paddy from previously barren fields. Culturally sensitive messaging – like invoking local history of traditional salt-tolerant rice or the pride of self-reliance – was used to motivate participation.

Women's self-help groups were engaged to spread information, given their networks and the fact that women often manage home gardens. Over time, as confidence grew, the community's role shifted from passive beneficiaries to active agents of the initiative.

Outcomes and Impact

The initiative has yielded significant outcomes, restoring hope and productivity to a region battered by climate disasters. By the end of 2022, the project's impact could be measured both in quantitative terms and in qualitative improvements in community resilience. Key outcomes and impacts include:

Restored Paddy Cultivation on Saline Lands ; 550 farmers involved in

The introduction of salt-tolerant paddy varieties enabled farmers to cultivate and harvest rice on fields that had been left barren due to salinity. A total of 550 smallholder farmers in cyclone-ravaged Patharpratima block successfully grew salt-tolerant paddy, transforming their once-scorched fields into green, productive plots. Yields from these varieties have varied by type, but many farmers reported harvesting a surplus beyond their family's consumption needs – a stark reversal from the zero yields of prior seasons.

Reduction in Crop Losses by 45% and Increased Resilience

Through the use of resilient seeds and improved practices, crop losses due to salinity and flood stresses have dropped by approximately 45% in the project areas. Prior to the project, any incursion of brackish water would wipe out the entire season's crop. Now, farmers are witnessing much lower mortality of rice seedlings and better recovery even if fields experience mild inundation. This dramatic reduction in losses directly translates to more stable incomes and less need for disaster relief or loans each year. The result is a community that can absorb climate shocks with less trauma.

Establishment of 3 Climate-Resilient Seed Banks; access to 1200 HHs

10 villages in the Sundarbans now host 3 community-managed seed banks. These banks collectively secure hundreds of kilograms of salt-tolerant paddy seeds, as a safeguard for future planting seasons. The presence of these seed reserves means that even if a cyclone strikes and farmers lose their current crop, they have immediate access to seeds for re-sowing once conditions permit. This development has broken the cycle of dependency where farmers used to wait for government or NGO aid for seeds after disasters. It also preserves genetic diversity: local strains and introduced salt-tolerant varieties are conserved year to year. The seed bank committees report that seed borrowing and repayment rates have been high, indicating community adherence to the system and trust in its benefits.





Adoption of Sustainable Farming Practices on 250 Acreage

The project promoted organic and water-efficient farming on a significant scale. By 2022, approximately 250 acres of farmland in the target area were under improved practices such as organic compost use and rainwater harvesting techniques. Farmers who adopted these practices have observed improvements in soil quality (e.g., better soil texture and earthworm presence due to composting) and reduced expenses on chemical fertilizers and pesticides.

Improved Livelihoods and Income Stability

With successful paddy harvests, households have regained a steady source of food and income. Many beneficiary families are now able to meet their own rice requirements and sell the excess grains or vegetable produce in local markets. This has led to an increase in household income for the first time in years. Although precise income figures vary, qualitative surveys indicated that at least 60% of the farmers involved no longer consider migration as their primary coping strategy. The Gram Pradhan of one village highlighted that several young men who had left for city labor jobs are contemplating returning, seeing that farming is becoming viable again. Such signs point to a broader socio-economic impact ie the revitalization of agriculture is contributing to community stability and cohesion.

Community Empowerment and Social Capital

An intangible but vital impact has been the boost in community morale and cooperation. The shared effort of managing seed banks, learning new techniques and witnessing positive results has galvanized community spirit. Women's involvement in decision-making through SHGs and seed committees has grown, empowering them within the household and community. Furthermore, farmers now have increased engagement with local governance – for instance, they collectively advocate for maintaining embankments and demand relevant schemes, leveraging the proof that their lands are worth protecting and can be productive. In essence, the project has not only delivered material gains but also strengthened the community's agency in driving their own development and resilience efforts.

Overall, the initiative has emerged as a successful model of livelihood restoration in a climate disaster-stressed region. By combining appropriate technology (salt-tolerant seeds) with grassroots institution-building (seed banks, training), it achieved measurable improvements in crop outcomes and livelihoods. Over 550 farming families (and by extension, a population of around 2,750 considering 5 members per family) now have better food security and a hope for sustainable income, directly aligning with the “Supporting Farming Livelihood Restoration Post Recurrent Cyclones” goal.

The Patharpratima case demonstrates that with the right interventions, communities can recover from disaster setbacks and build resilience against future ones. The quantified impacts – such as the 45% reduction in crop loss – also provide a compelling evidence base for scaling up this approach in other vulnerable coastal regions.



CHALLENGES AND ADAPTIVE MANAGEMENT

Implementation Challenges

The project faced several significant challenges during implementation. COVID-19 restrictions limited community meetings and training programs, requiring adaptation of implementation strategies. Transportation disruptions affected seed and input distribution, necessitating alternative delivery mechanisms.

Technical challenges included identifying appropriate salt-tolerant varieties for local conditions and adapting cultivation practices to saline environments. Initial seed bed establishment faced difficulties with water availability and soil preparation in some locations.

Community mobilization challenges included skepticism about new varieties and resistance to changing traditional practices. Some farmers were hesitant to adopt unfamiliar cultivation techniques, requiring additional demonstration and persuasion efforts.

Adaptive Management Responses

The project demonstrated strong adaptive management capabilities by modifying implementation strategies in response to emerging challenges. COVID-19 restrictions led to the development of smaller group training sessions and increased use of demonstration plots for knowledge transfer.

Technical challenges were addressed through partnerships with agricultural research institutions like Rice Research Institute and IIT Kharagpur and increased field testing of varieties. Alternative seed bed locations were identified when initial sites proved unsuitable, demonstrating flexibility in implementation.

Community resistance was addressed through increased demonstration activities and peer-to-peer learning approaches. Successful early adopters were encouraged to share their experiences with skeptical neighbors, creating organic acceptance of new practices.



Lessons Learned and Sustainability Measures

As the project was implemented and matured through 2021–2022, several lessons emerged that are guiding future efforts and ensuring the sustainability of the intervention. These lessons learned are valuable for continual improvement and for informing similar projects in other regions.

1

Traditional Knowledge are Invaluable

One key insight was that re-discovering traditional or indigenous solutions can be highly effective. The salt-tolerant rice varieties ultimately used were not entirely new inventions; many were improved or locally-adapted versions of strains that had historically grown in saline conditions. Engaging with veteran farmers and local research institutions helped identify these varieties. The success of these seeds reinforced that embracing traditional knowledge (e.g., older salt-tolerant paddy and heirloom seeds) in tandem with scientific support yields resilient outcomes. In a world where modern hybrids had pushed out local strains, this project learned the value of biodiversity and traditional seed banks as a defense against climate extremes.

2

Community Ownership Drives Success

It became evident that community ownership of the project – especially through mechanisms like seed banks – was crucial. In the early phase, some farmers were skeptical about the new seeds and methods. However, as soon as local farmers like Ganesh Samanta or Tapasi Halder became agents of change by demonstrating positive results, uptake increased dramatically. This underlined the lesson that investing in a few pioneers or model farmers can catalyze broader change. Moreover, the seed bank committees showed that when communities are entrusted with managing resources, they rise to the occasion. The pride and responsibility taken by villagers in running their seed banks and training peers indicate that such participatory models are far more sustainable than top-down distribution of aid.

3

Holistic Training and Continuous Support

Simply distributing salt-tolerant seeds without changing agricultural practices would not have yielded the full benefits. The project learned that training in organic and climate-smart practices was a critical complement to the seeds themselves. Many farmers initially struggled with unfamiliar techniques (e.g., making organic fertilizer or adjusting to a different sowing calendar for new rice varieties). Continued handholding, demonstration plots, and refresher trainings were necessary to cement these practices. Thus, a lesson is that technology introduction (seeds) must go hand-in-hand with behavior change efforts (farming practices). Also, aligning these practices with existing knowledge (for example, showing that composting is analogous to traditional manure usage, but improved) helped farmers accept them more readily.

4

Climate Resilience Requires Diversification

While rice is the staple and restoring paddy farming was the focal point, the project observed the benefits of diversification. Those farmers who also took up salt-tolerant vegetables or integrated a second crop (like a mustard in winter, or a fish culture in pond areas) fared better overall, especially if one crop underperformed. This drove home the lesson that diversified livelihoods and cropping systems are inherently more resilient. Going forward, the project is incorporating more components (as indicated in SEED's plans to introduce salt-tolerant seeds of other crops beyond paddy). Diversification also spreads risk and can provide year-round income, which is a sustainability boon.

5

Policy and Advocacy are Important

An external lesson learned is the need to link community efforts with policy support. The project outcomes have been shared in regional forums and with government agriculture departments to advocate for broader adoption of salt-tolerant crop promotion. One learning has been that without supportive policies (for example, inclusion of salt-tolerant seeds in government seed subsidy programs or formal recognition of community seed banks), scaling up will be slower. SEED realized it must play a role in advocating for these changes, ensuring the model influences larger DRR and agricultural development plans in West Bengal. Encouragingly, local authorities have taken note of the project's success, and discussions are underway to integrate its approach into the district disaster management plans for livelihood recovery.

Sustainability Measures

From the outset, sustainability has been built into the project's design. The community seed banks are a prime measure ensuring continuity – they provide a self-replenishing supply of resilient seeds beyond the project's lifecycle. Each season, farmers contribute back seeds, creating a revolving system that does not depend indefinitely on external seed provision. Secondly, the knowledge imparted through training is a lasting asset. Farmers have gained skills in organic farming and adaptation that they continue to use and even transfer to the next generation. SEED also established local resource persons (lead farmers) who can act as community trainers in the future, reducing reliance on outside experts

Economically, the project sought to enhance sustainability by improving profitability of farming – through cost savings (using on-farm inputs like compost) and potentially better market linkages for organic or specialty rice. More stable and higher farm incomes mean farmers can maintain the practices (e.g., they can afford to invest time in composting because it saves fertilizer costs and increases yield).

On an organizational level, linkages with government schemes act as a sustainability anchor. For example, after seeing the benefits, some farmers enrolled in government soil health card programs and availed grants for rainwater harvesting structures, complementing project activities. The convergence of our initiative with such public programs means the work can continue with government support. SEED's own commitment is ongoing as well – being an organization rooted in the community, it has integrated this project into its regular programming, with staff assigned to monitor the seed banks and provide advice each season.

Finally, a philosophical yet practical takeaway underpins the project's sustainability: patience and persistence. As SEED staff noted, you cannot undo years of damage overnight – “We cannot assure to bring back their good days all of a sudden in a single go. But we sincerely believe that this small effort will provide them a little support to their livelihood”. Incremental gains each season have, over a few years, amounted to a transformative change. The project's legacy will be a community that has learned to adapt step by step, continuously improving its resilience. The lessons learned here ensure that future initiatives – whether by SEED, the community, or supporting bodies – can replicate and scale this model, giving more disaster-affected communities a pathway to sustainable livelihood restoration.

Conclusion

The Climate-Resilient Livelihood Restoration Project stands as a strong and replicable model for addressing the multifaceted impacts of climate change on agricultural livelihoods in disaster-prone regions. Anchored in the core pillars of Disaster Risk Reduction and Management (DRRM), the project successfully integrated relief, rehabilitation, risk mitigation, resilience building, system strengthening, and community capacity development into a cohesive intervention.

By introducing salt-tolerant paddy seeds, establishing decentralized seed banks, and training farmers in climate-smart and organic practices, the project directly contributed to livelihood restoration while simultaneously building adaptive capacity. Its emphasis on community participation and ownership fostered not only immediate recovery but also ensured the sustainability of outcomes beyond the project period. The creation of local governance structures around seed banks, and the active role of women and self-help groups, embedded resilience into the community's social and institutional fabric.

The collaborative model—bringing together civil society organizations, local governance institutions, government research stations, and grassroots communities—exemplified effective system strengthening and multi-stakeholder coordination, critical for disaster preparedness and long-term resilience. Moreover, the project's work in establishing seed reserves and training networks also served as a mitigation strategy, reducing future vulnerability to cyclones and saline intrusion by ensuring timely replanting and food security.

Importantly, the project's innovation in community-based seed systems and ecosystem-based adaptation techniques offers a scalable pathway for other climate-vulnerable geographies. It reflects how agricultural interventions, when aligned with DRRM frameworks, can address both immediate post-disaster recovery needs and longer-term risk reduction goals.

As climate events intensify, the importance of such integrated, community-led approaches will only grow. This project has not only restored lost livelihoods but demonstrated how disaster response can evolve into resilience-building—offering valuable insights for the design and implementation of future DRRM strategies focused on safeguarding the most vulnerable through sustainable, localized, and participatory action.

This report represents the comprehensive documentation of a community-driven initiative that successfully combined immediate disaster response with long-term resilience building, creating a model for sustainable agricultural development in climate induced cyclone pro regions.

